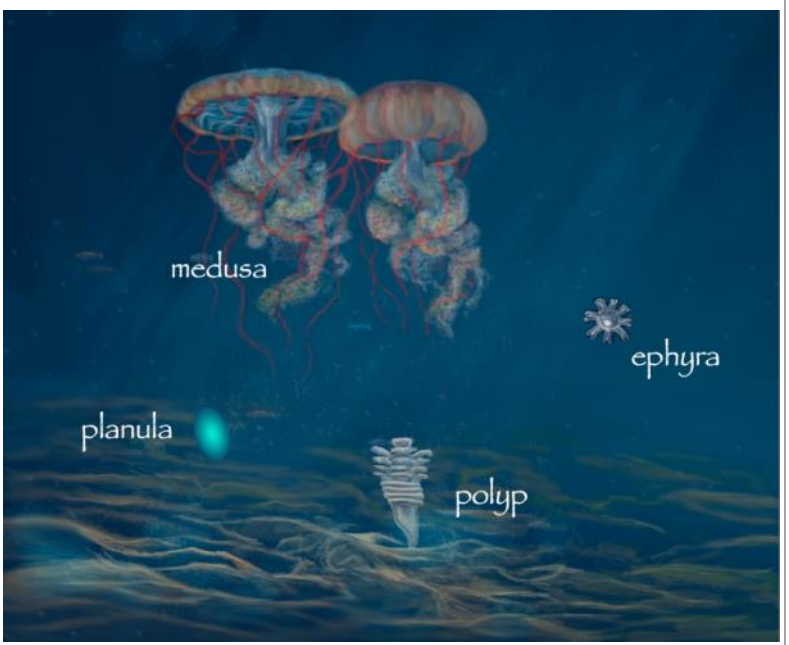
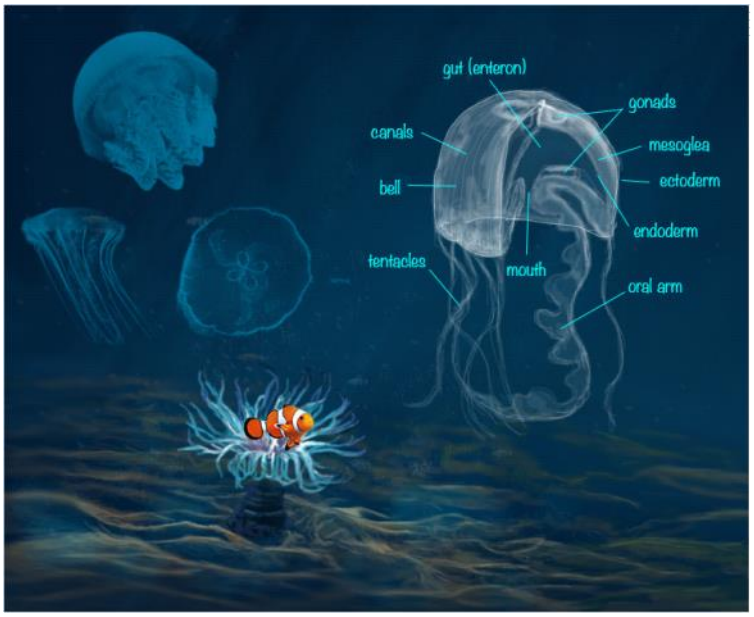
Jellyfish_Cnidarians

Wednesday, April 02, 2014
10:11 PM

Slide	Notes
	Jellyfish and other cnidarians.
 Design notes: The ephyra and the jellyfish have animations for the Captivate 8 version.	Several jellyfish look astonishingly different in various phases of their development. The medusa form is what they look like as an adult. They can reproduce sexually and individuals are specifically male or female. The male will release sperm from the testes which is the male gonad. The female has ovaries which is the female gonad which are located in the gastrovascular cavity. The sperm will swim into the mouth opening and fertilize the eggs. The eggs will mature into the next phase of development, the planula. This is the larval form and it is covered in celia to allow movement. Some species of jellyfish will develop directly into a medusa from this stage and others will enter a polyp phase in which the planula gives up its free swimming days to settle down into a temporary sesile life style. It will use a basal disk to cement itself to a surface. It then begins to develop layers of asexually produced individuals through budding. The most mature ones will be at the top. When the topmost one matures anough, it will break free and become an ephyra. These continue to grow until they become medusa and the whole cycle starts all over again. Some jellyfish species can regenerate if they are in the polyp phase. If something tears them into pieces the individual pieces can grow into new individuals.
	Jellyfish are radially symmetric, as are all cnidarians. That means you can divide them in half and have symmetry if you



Design notes:
The sections get highlighted in green as they are talked about.

means you can divide them in half and have symmetry if you cut through the middle so long as you make a vertical, not horizontal cut.

Their external anatomy is pretty simple. Their primary body is the bell. The bell is made up of three layers. The ectoderm is the outer epithelium and that transitions to the endoderm which lines the interior of the gastrovascular region which makes up the jellyfish gut. The jellyfish has no lungs because it can breathe right through the ectoderm and endoderm. I did say three layers, so we have one more yet, the mesoglea. This

They have an aboral side which is their top side and they have an oral side where you will find tentacles and the mouth opening. Though in a different class than jelly fish are, sea anemone are also cnidarians and they have an aboral side that faces toward their basal disk which cements them into one place and they too also have a tentacle ringed oral side.

They do have a simple nervous system, but they do not have a brain. Their nervous system is embedded in the surface of their bodies. They have the ability to recognize species of their own kind and they have simple sensors that can detect light.

They have no skeleton and are made up of 98% water. Despite their fragile appearance, some species even live under the great pressures of the depths of the ocean. They display a dazzling light show.

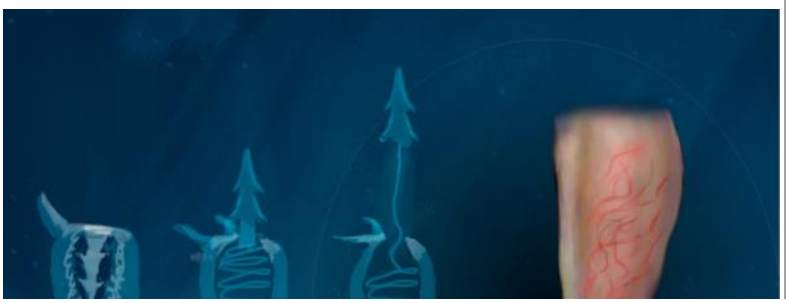
Muscles are contractile tissue embedded in the ectoderm. They swim by rhythmic contractions of the bell. Though they can swim, often these are classified as plankton because they are largely just carried by the current.

We have already talked about the reproductive system, but here you will get to see where the gonads are.

Digestive - Passive feeder. gastrovascular cavity. no true gut. Eat and eliminate out of the same opening. Waste goes right back out through the mouth. Nutrients are distributed through a series of canals. The ones in the bell are often quite visible in some species.

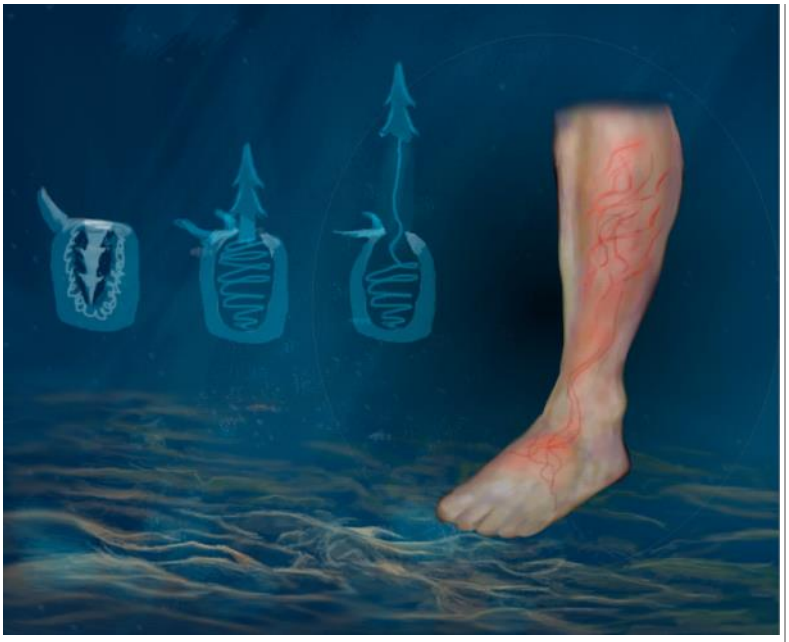
They feed by catching prey with stinging cells that are on their tentacles. Jellyfish tentacles can be short as wee see here with a cannonball jellyfish or they can be tremendously long. A record holding Ma o War jellyfish had tentacles 164 feet long.

Once their prey is paralyzed, which doesn't take long, they pull the prey up to their mouths using their tentacles and oral arms.



Let's look more closely at the jellyfish stinging cells. These are called nematocysts. Jellyfish have an average of 750,000 stinging cells on their tentacles. Just one millimeter of skin can receive as many as 2,000 harpoons if you are unfortunate enough to be stung. In Florida, one in four swimmer will get a jellyfish 'burn', but these are not true burns. Small prey are instantly paralyzed by the venom which is a neurotoxin as well as a hemotoxin which destroys blood cells.

Let's examine one of these nematocysts. They are a capsule embedded in the epithelium of the tentacles. They have a harpoon that points inward into the cavity which is attached



Design notes:
Nematocyst is 'animated'. I have it in three stages here for the purpose of study notes.

750,000 stinging cells on their tentacles. Just one millimeter of skin can receive as many as 2,000 harpoons if you are unfortunate enough to be stung. In Florida, one in four swimmer will get a jellyfish 'burn', but these are not true burns. Small prey are instantly paralyzed by the venom which is a neurotoxin as well as a hemotoxin which destroys blood cells.

Let's examine one of these nematocysts. They are a capsule embedded in the epithelium of the tentacles. They have a harpoon that points inward into the cavity which is attached with a coil. If the trigger is activated by touch, the top pops open and the tiny harpoon is shot out at the speed of a bullet. It is tethered to the capsule which will allow the jellyfish to reel in the prey to its mouth.

The triggers are both mechanical touch as well as chemical sensing. These can only be used once, so the jellyfish would expend unnecessary energy if the nematocysts fired of by just touching a rock. Once touched, the harpoon is released delivering a venom. Stingers continue to pump the toxin in. Much like a bee, you can get stung even after the jellyfish is dead.

Like jellyfish, another cnidarian has nematocysts too. Hydra have the same type of triggered harpoons; however, theirs are just pressure sensitive.

The sea anemone's nematocysts are just chemically triggered. The clown fish uses this to its advantage. It can hide in the sea anemone tentacles safe from predators but because it has a special kind of mucus, it doesn't trigger the sea anemone's harpoons. The two have formed a classic symbiotic relationship. The clownfish gets protection and the sea anemone often gets a few tidbits of the clown fish meal.

There are a few organisms that are immune to the toxin: basking shark, sunfish, and sea turtles. These are predators that find jellies to be tasty and easy meals.

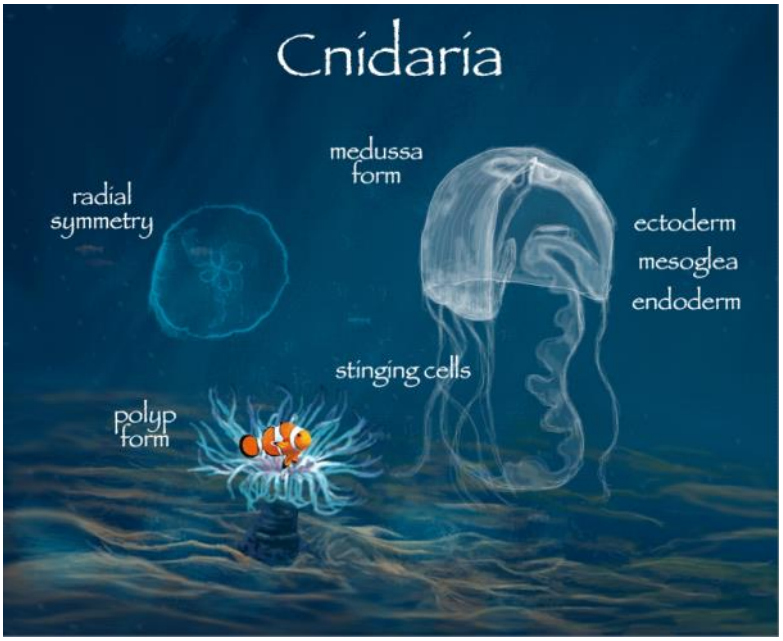
Design notes:
I do have an animated swim cycle for the turtle for the Captivate 8 version.

Jellyfish are classified as carnivores, but most are passive hunters. They wait until prey stumbles into the danger zone of their stinging tentacles.

they are predators of …
plankton
Small fish
Crustaceans
Fish eggs
other jellyfish

They are on the menus of other organisms though too. They are prey of …
Sea turtles
Fish - tuna, swordfish, some salmon
Basking sharks because they are immune to the jellyfish sting
And even sea anemones if they get too close.

Jellyfish are from the phylum cnidaria. At one time they were



more commonly knowb as coelenterates (suh lin ter ates) because they cave a coel (ssel) which is a large body cavity.

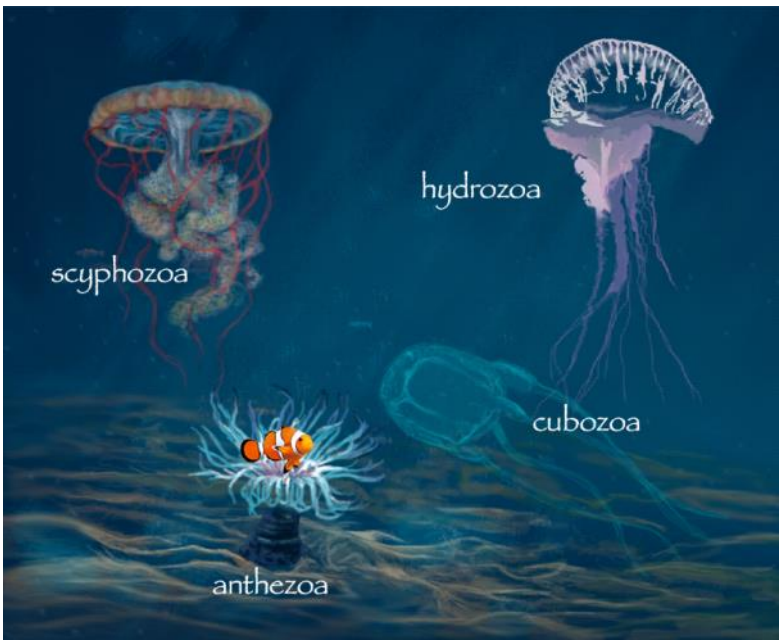
All cnidarians have …

a three layer body consisting of an outer ectoderm, an inner endoderm which forms the gut, and a non-living jelly-like substance called mesoglea.

They have stinging cells used to paralyze prey and protect from predators.

They can come in a free-swimming bell shape or they can be sessile as a polyp. The jellyfish is unique in that in its life cycle it will pass through both forms.

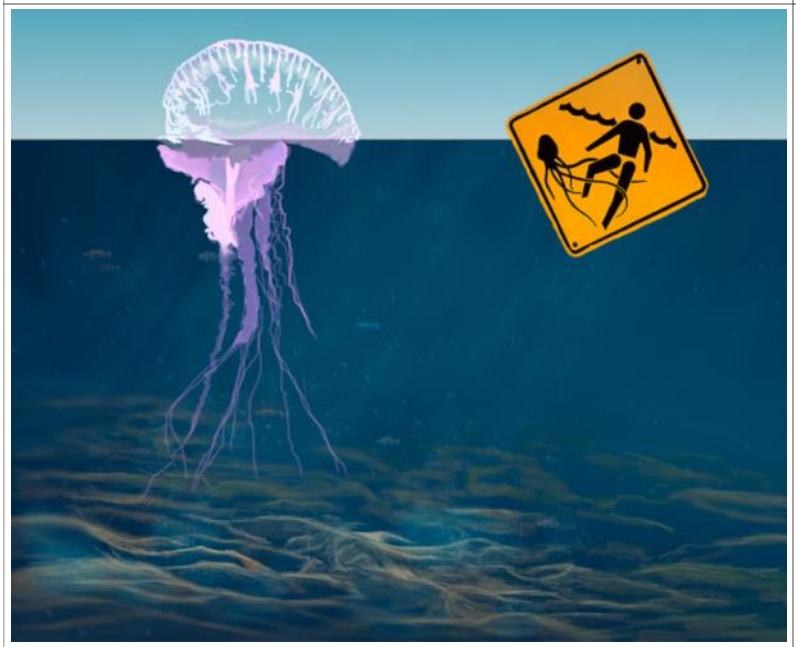
Their body shape is radially symmetric.



There are 4 main groups of cnidarians:

Anthozoa -

Scyphozoa - Over 300 species, most jellyfish. Light sensitive cells. Large numbers - bloom or jellyfish soup.

	Cubozoa - box jellyfish. Most venomous creatures in the ocean. Can kill a man in 5 minutes. More cubical in shape and can go faster than a scyphozoa because the bell ends in a flap the increases the flow rate of water it can expell. Four main true eyes complete with retina, cornea, and lens as well as 20 simple eyes that just detect light. They also have memory and obstacle avoidance and they hunt their prey instead of passively feeding. Tentacles can get up to 3 meters which is about a door and a half tall and in total they have up to 500,000 stingers. Don't think size matters with these though. One species of box jellyfish is a mere thumbnail size but they can kill an adult quickly.
	Hydrozoa - over 3,000 species. hydra and Potuguese Man o War. Most form colonies. Mon o War several species that all work together as one organism. Some specialize with stinging cells. Other specialize for reproduction. Some for the float.

	Anthozoa - sea anemones, corals, sea pens. They will live their whole life in polyp form. They have more developed gastic system with vertical partitions called septa. These give greater surface area for digestion. Coral reef are large colonies of anthezoa. They have a symbiotic relationship with dinoflagellates called zooxanthellae (zoh zan thel lee). These produce carbon containing compounds that supply not only energy but also the building material for the coral itself.