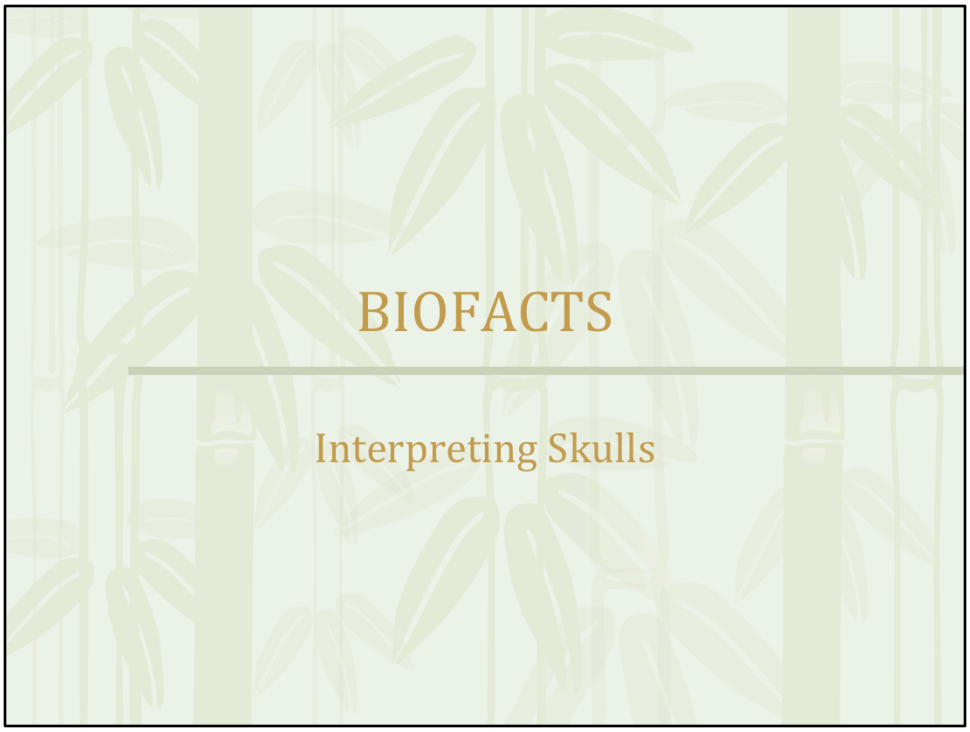
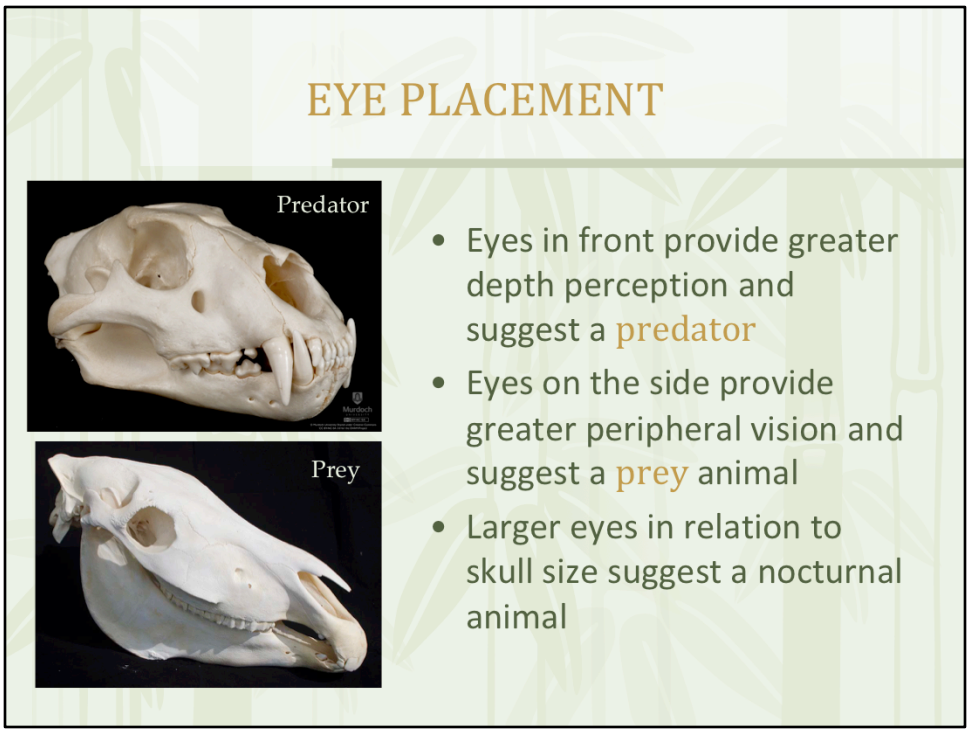


Biofacts provide docents with a variety of hands-on teaching tools. Biofacts may include skulls or bones, antlers, pelts or feathers. Biofacts are often the key to a learner's imagination, helping to connect information with a tactile and visual experience. Animal skulls are a great tool for teaching about the diversity of wildlife and the special role each animal plays in its natural environment.

Each species of animal has a characteristic skull shape that is suited to a particular lifestyle. By looking at a skull, we can find clues to what it may eat, whether it is a predator or prey animal, and which senses are most important to the animal's survival. When you look at an animal's skull, look at the teeth, eye position, nasal passages, structure encasing the inner ear, and the attachment of the jaw to the skull as well as the attachment of the skull to the spinal column.

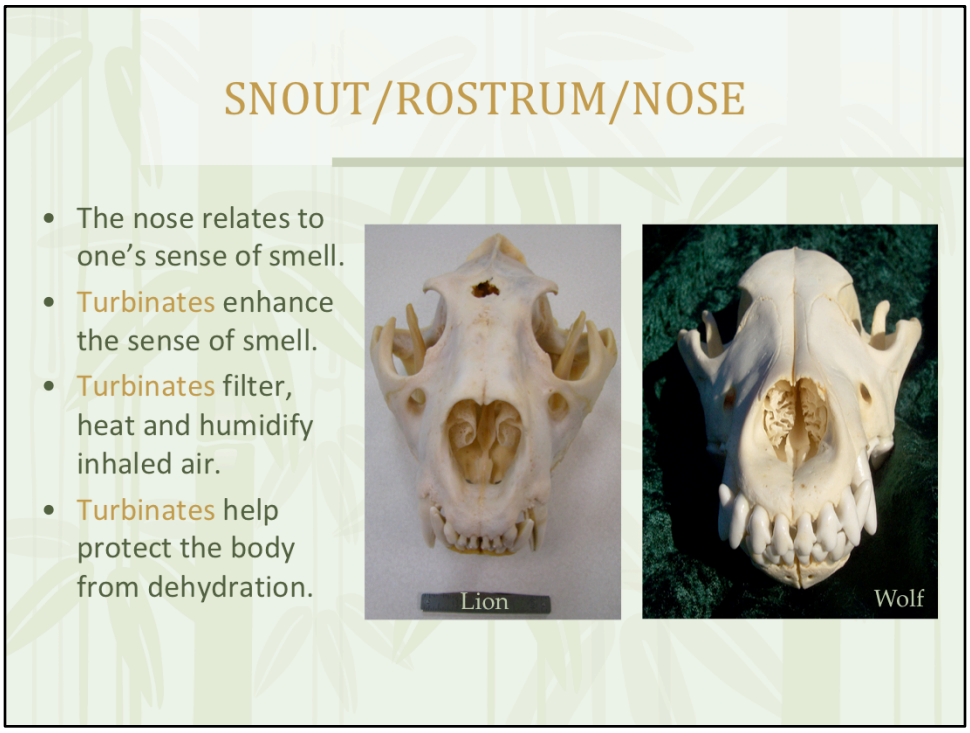


Eye sockets of a skull can tell you about an animal; eye placement varies among animals depending on the role of eyesight in their lives. Eyes that face forward on a skull suggest a **predator**. Forward facing eyes allow for **binocular** and **stereoscopic vision**, which allows an animal to have a wider field of view and able to judge depth so it can calculate the distance to its prey. Predators use their depth perception in their pursuit of fleeing prey. Cats and owls are excellent examples of predators that use forward facing eyes when hunting their prey. Monkeys also have forward facing eyes that give them depth perception needed to swing and leap in their arboreal habitat.

Animals with eyes that are located on the side of its head suggest a **prey** animal. Side eye placement allows for greater peripheral vision and a wide range of view; this provides nearly a 360-degree field of view at all times, a tremendous advantage when surveying the landscape for movement and possible threats. Side eye placement enables the animal to see predators approaching from the side as well as from behind. Peripheral vision is very important for protecting a prey animal when it is grazing or feeding. When you see herd animals, are they all facing the same direction? Within a herd, there can be 360^0 degree vigilance, since all the individuals are not all facing the same direction.

A good way to remember if an animal is a predator or prey: **"Eyes in the front, the animal hunts. Eyes on the side, the animal hides."**

Eye sockets that are large in relation to the size of an animal's skull may suggest an animal is **nocturnal** and is active at night. A relatively larger eye lets the animal see better in dim light conditions This is the case with cats and owls. Many nocturnal animals have a reflective layer at the back of their eye that reflects the light back, allowing them to see better in the dark. (especially seen in cats and lemurs). Large eyes are also seen on the California sea lion where there is not a lot of light in the ocean at depth.



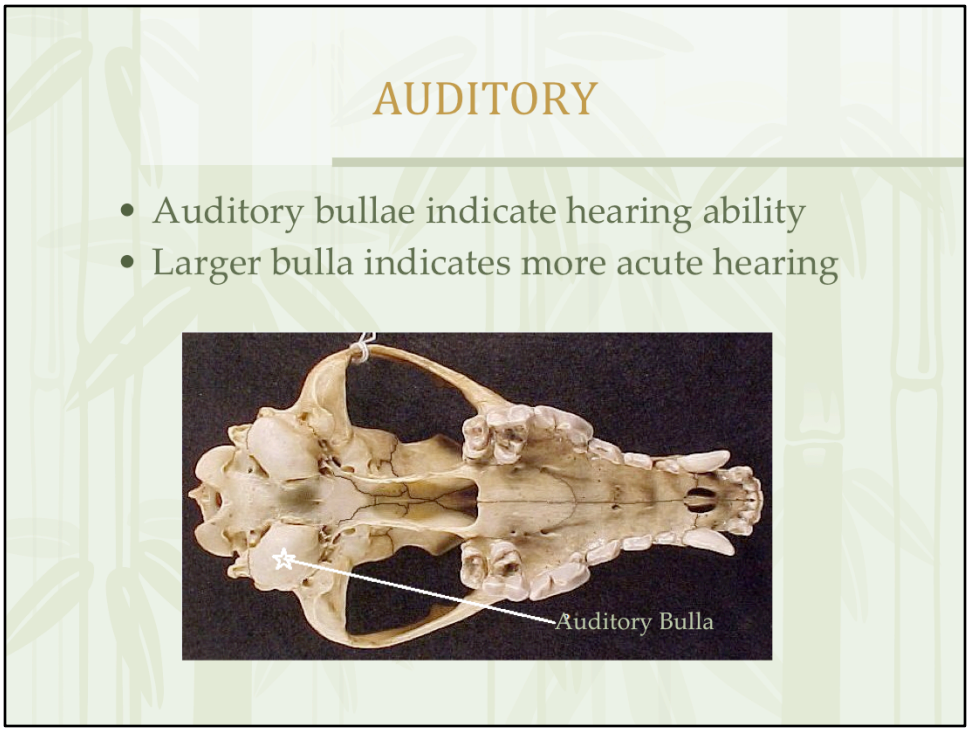
The relative size of the nasal passage on a skull is an indication of the animal's sense of smell. The thin, bony structures inside the nasal passage, the **turbinate bones**, provide the framework for membranes which sense odor in vertebrates. A grizzly bear has an extremely acute sense of smell, with well developed turbinates. Grizzlies can detect animal carcasses from a distance of approximately 20 miles away. Use the grizzly skull at the exhibit to show the turbinate bones.

Turbinates also function to filtrate, heat, and humidify air inhaled through the nose. The turbinates capture more than 75% of the water vapor exhaled from the lungs and thus help protect the body from dehydration. The snow leopard's enlarged nasal cavity helps them warm the cold air they breathe while retaining water. The enlarged nasal cavity of the snow leopard allows cold air to be warmed on inhalation and assists in breathing at high altitudes.

An elongated nose might suggest that an animal hunts by following or locating scents or that it uses its nose to probe the ground or vegetation. A deer's long nose and corresponding higher eye placement allows him to scan for predators while grazing. Wolves and bears hunt for food by scent using their long noses that contain millions of scent receptors. Cats have an acute sense of smell, but doesn't measure up to a dog's, which has a longer nose.

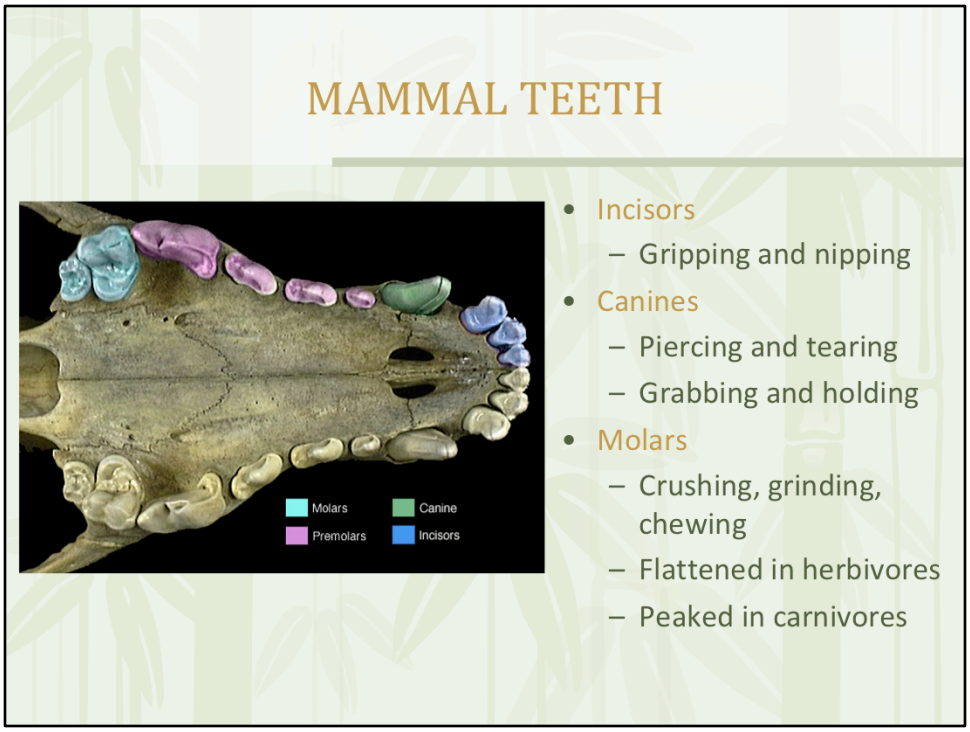
Humans have a poor sense of smell compared to most animals.

Note: Some animals have an auxiliary olfactory sense organ (the **VMO** or **Jacobson's Organ**) including snakes and lizards, cats, wolves, ungulates and lemurs. This organ is at the roof of the animal's mouth and is used to detect chemical stimuli. In some mammals (i.e. cats and hooved animals), this organ is involved in the **flehmen response**, which is used to detect **pheromones**, chemical messengers that carry information between individuals of the same species. You will be learning about this more as we delve into the reptiles and mammals.



A skull can also provide clues to an animal's hearing ability. The **auditory bullae** (singular bulla) are the bony protrusions of a skull that encase structures of the inner ear. In general, large protrusions indicate an excellent sense of hearing. Cats have comparatively large auditory regions and very acute hearing. Deer and antelopes have a relatively poor sense of hearing as compared to that of a cat.

In birds, you will see these auditory regions are relatively prominent.



The most important characteristic in identifying a mammal is its teeth. All mammals have teeth except for monotremes (egg laying mammals), anteaters and certain whales. There are different kinds of teeth to perform different functions (chewing, crushing, cracking, gnawing, grooming, digging, defending and communicating). The type of teeth, their shape, size and number helps you determine the animal's lifestyle and diet.

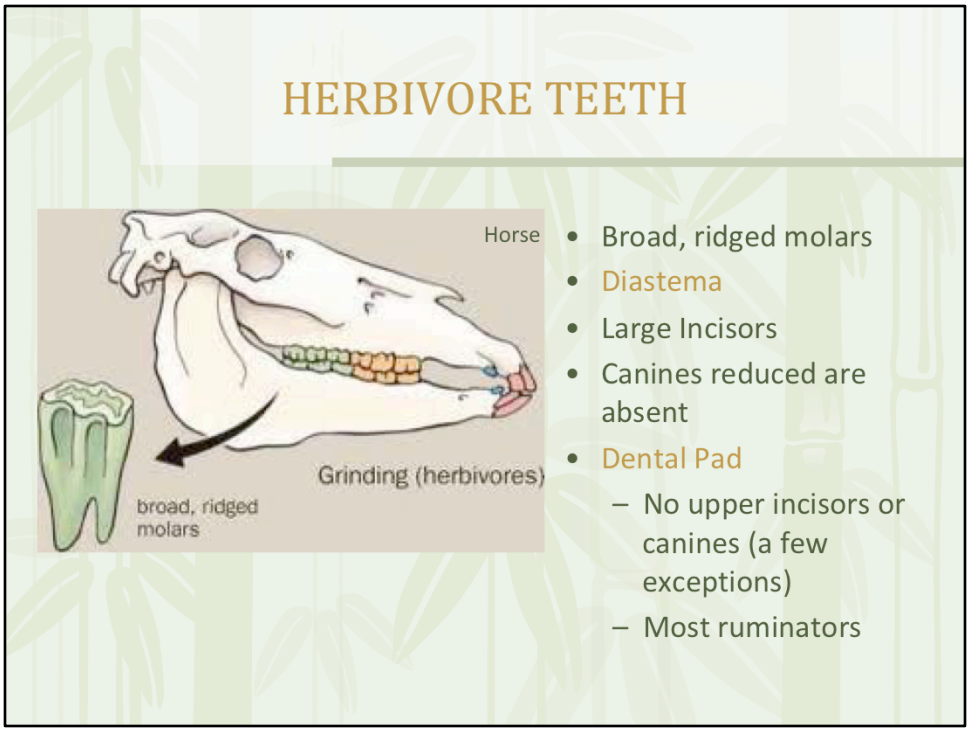
Mammals are **heterodonts**; they have three types of teeth. **Incisors** are in the front of the mouth and used for food gathering. They are designed for biting, cutting and stripping. Whereas, amphibians and reptiles are **homodonts** and their teeth are all the same in an individual species. Modern turtles and birds do not have teeth.

Canines are also positioned at the front of the mouth. They are sharp and are designed for grabbing, piercing and tearing. Predators use their canines to kill their prey.

In the sides of the mouth are **premolars** and **molars** (also known as **cheek teeth**). Molars and premolars vary in shape or size depending on their function. Premolars are used for grinding, crushing, slicing, and shearing, whereas molars are designed to grind and crush vegetation.

All of these teeth types may be present in different numbers from species to species, or some may not be present at all. In mammals, the teeth in the upper jaw match up with lower jaw, which aids in chewing, especially in helping to break down plant material. Reptile teeth do not match up and many species swallow their food whole.

Why do mammals have specialized teeth? By having specialized teeth mammal's became more efficient than other vertebrates and this allowed them to occupy many different ecological niches.

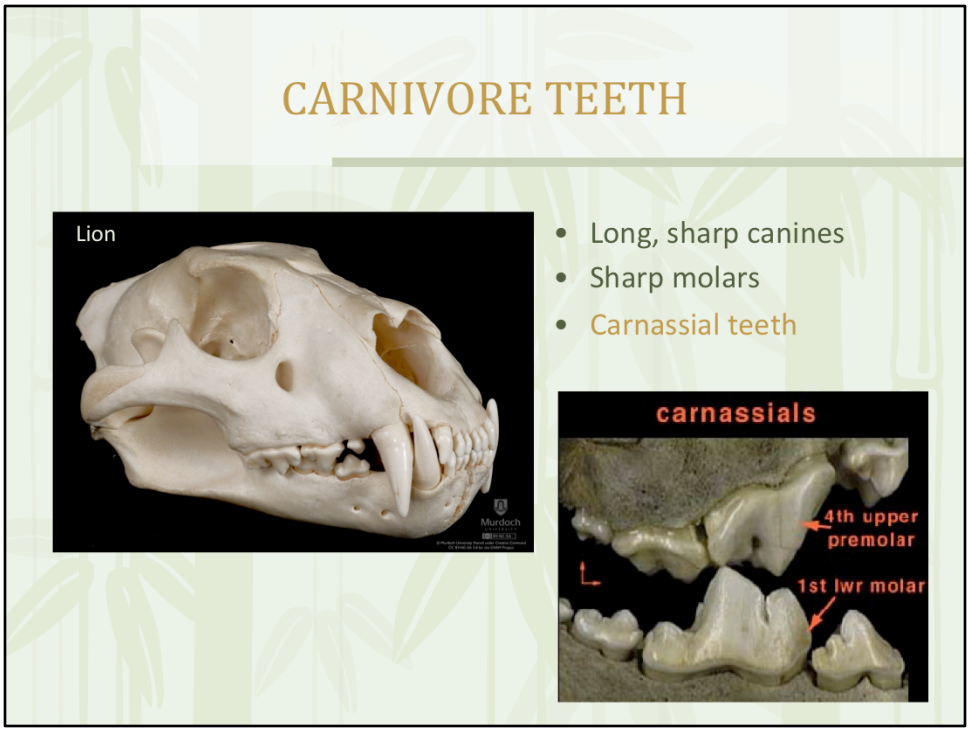


Plants are made of **cellulose**, which is a difficult component to break down. Animals do not have an enzyme that breaks down the cellulose. To help with cellulose digestion, herbivores have developed a grinding surface on their teeth that aids in their digestion of this fibrous material. Note: their digestive systems are also adapted to a plant-based diet. How does the cellulose in plants affect the digestive tract of the ruminants, a foregut fermentor? The ruminants have a four-chambered stomach and have microbes in their stomach to help break down the cellulose before the nutrients get absorbed in the intestines. How does the cellulose affect hindgut fermentors? These animals usually have longer intestines and microbes are in the intestinal tract or in many cases in the cecum. (i.e. koalas have a 7' cecum for digestion)

In general, **herbivores** tend to have well-developed premolars and molars, often with sharp ridges on the tops for grinding; the broad teeth act like grinders, grinding vegetation into a pulp. Incisors are clipper-like to snip off foliage from branches. Canines are reduced or absent.

Herbivores typically have a long toothless portion from the premolars to the incisors, called a **diastema**. This hole provides room to reposition plant material as the animal grinds with its molars to break the material up. Herbivores have narrower mouths in relation to head size and very muscular tongues to move food about and grind it down on the flat platforms of their molars.

Zebras and other horse-like species have both large upper and lower incisors. Some ruminating species, such as deer, cows, and giraffes, have only lower, flat shaped incisors that meet the upper toothless gum, called a **dental pad**. There is a plate of bone under the skin instead, to grind against.



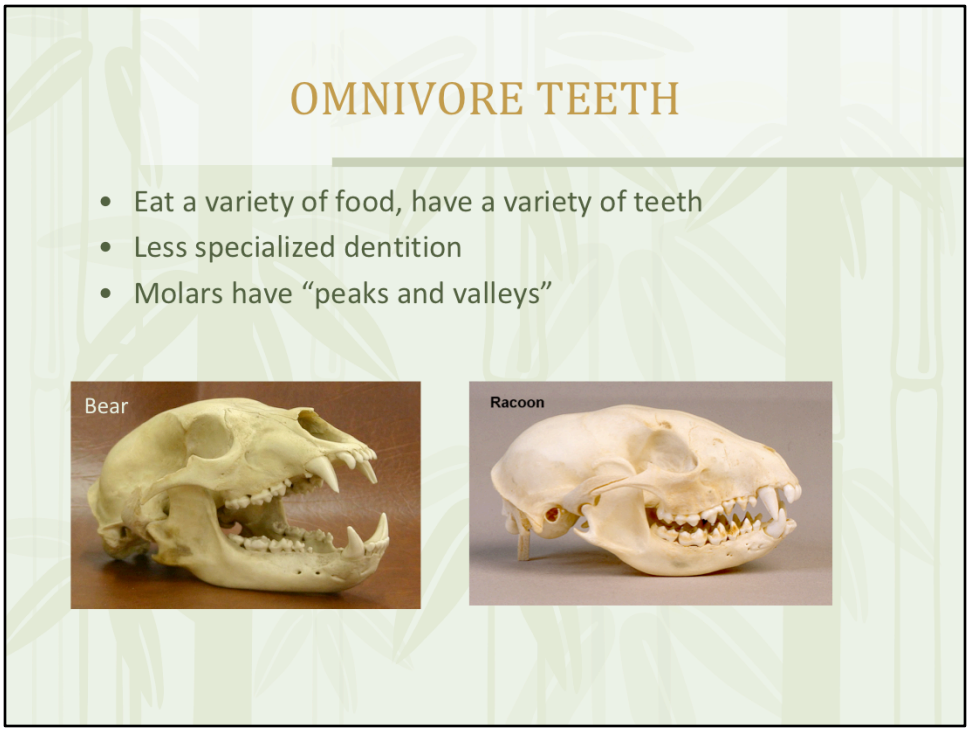
Carnivores have a full set of teeth: canines, incisors, molars, premolars. Their canines are long and used to slash, rip and tear meat. The large canines, especially in cats, are very effective weapons during a hunt; uses include gripping prey and they are the main teeth used in a choke hold. When killing prey, the canines lock into the meat in the neck, preventing the prey from pulling out of the hold, and the airway is closed off by clamping down on the throat.

In many carnivorous mammals (especially the Order Carnivora), there are four modified cheek teeth (molars and premolars) called **carnassials.** Carnassials are shaped like knives or blades and act as scissors to shear flesh and bone; they help cut and chew off chunks of meat. Carnivorous animals tend to have wide mouths in relation to their head size and highly developed jaw muscles, whereas the herbivore mouth is more narrow.

In the Order Carnivora, the cat-like species are equipped with relatively shorter jaws and thus are capable of a more powerful bite force. In contrast, the dog-like species have relatively longer jaw bones and thus are able to snap their jaws shut quickly but have a weaker bite force than the cat-like species. Dog-like species typically have relatively large incisors, which they use for grooming. Note: cat tongues are like sandpaper and are used to help get the last bit of meat of their prey and are also used for grooming.

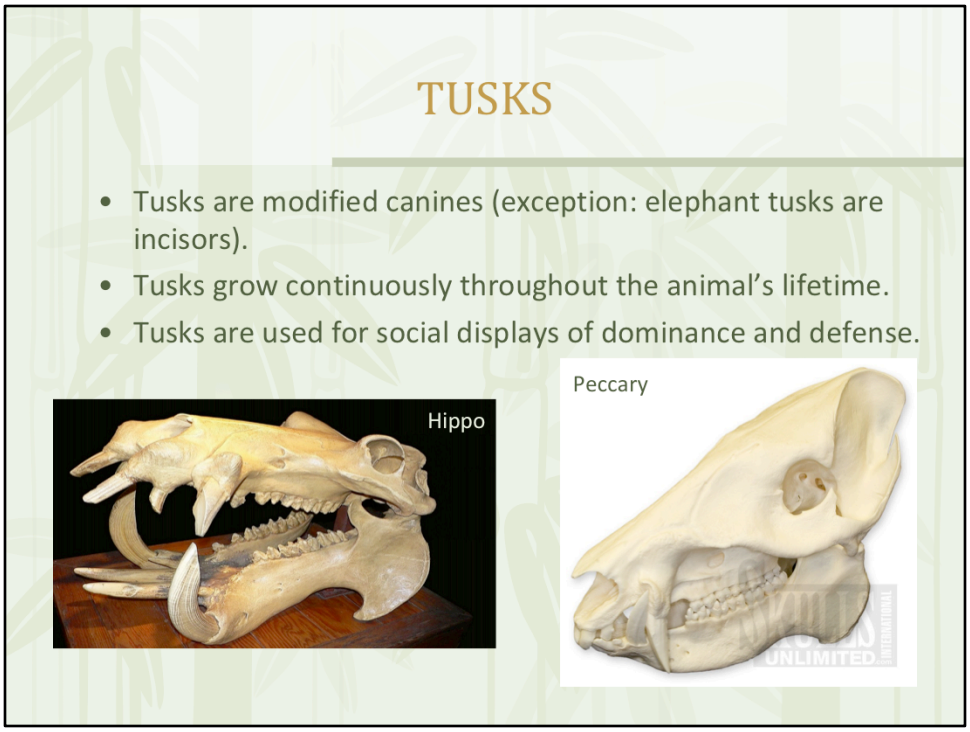
Wolverines have an upper molar which is turned 90 degrees allowing them to eat frozen meat and crush through bone.

Insectivores are a specific type of carnivore; they eat insects almost exclusively, and have fine, needle-like teeth. (i.e. many lizards, frogs bats and spiders)



Omnivores have a full set of teeth (canines, incisors, molars, and premolars); they eat plants and meat. Omnivore’s teeth are less specialized than herbivore’s and carnivore’s. They have molars between carnivores and herbivores, with more “peaks and valleys” due to the varied diet; cheek teeth are wide with low bumpy surfaces. Incisors are wide, narrow at the tips, and somewhat chisel-shaped, making them useful for biting off chunks of meat or plant material.

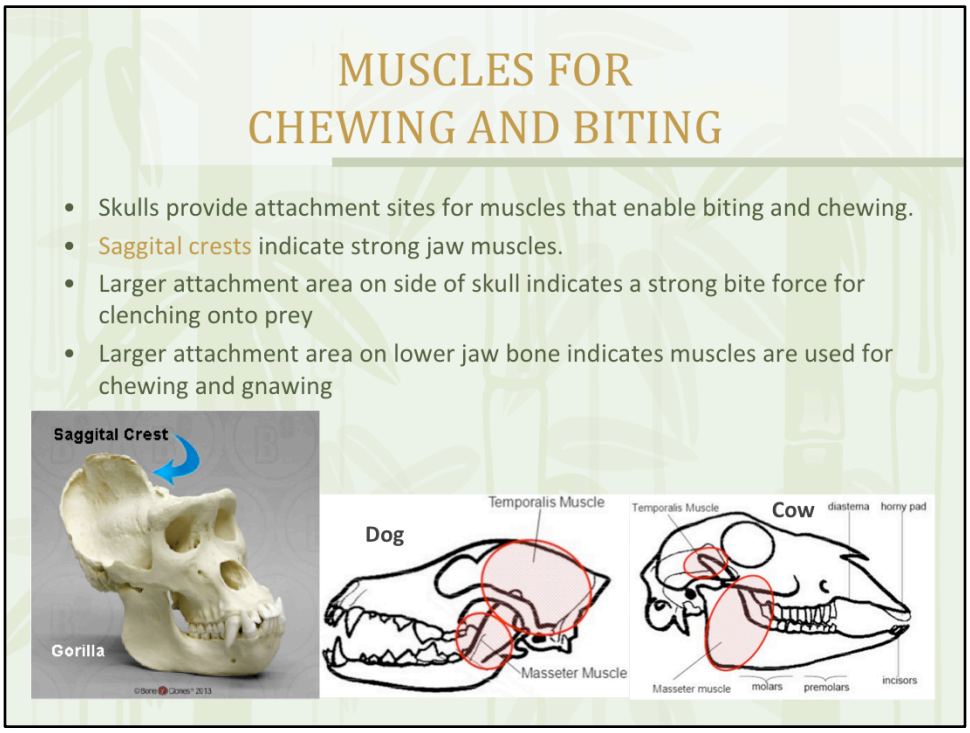
All bears are omnivores, but each species has a unique diet – their teeth tell the story. Polar bears are the most carnivorous of the bears and use sharp canines to rip out chunks of meat. They tend to swallow these chunks without much chewing, so their molars are reduced in size. Plants make up a great portion of other bear species. The black bear, for example eats much more vegetation, so their molars have larger, flatter grinding surfaces than the polar bear, who is the most carnivorous of the bears.



Tusks are elongated, continuously growing front teeth that protrude well beyond the closed mouth of certain mammal species. Tusks are commonly the elongated canine teeth, such as those found in warthogs, pigs, peccaries and walruses; in the case of elephants, the tusks are elongated incisors. In most tusked species, both the males and the females have tusks, although the tusks of males are larger. In the hippo, the enlarged incisors and canines are not tusks as they are not seen when the hippo's mouth is closed. However, they are tusk-like and are continuously growing teeth that can inflict deadly wounds when used defensively. (see hippo photo on left)

Tusks have a variety of uses depending on the animal; social displays of dominance, particularly among males, are common, as are tusks used in defense against attackers. Elephants use their tusks as digging and boring tools. Peccaries use their tusks for crushing hard seeds and slicing into plant roots as well as for defense against predators.

Humans use the ivory of tusks to create artifacts, jewelry, and piano keys. Consequently, many tusk-bearing species have been hunted commercially or poached and are now endangered. The ivory trade has been severely restricted by the United Nations Convention on International Trade in Endangered Species (**CITES**) of Wild Fauna and Flora. Note: traditionally, ivory has been associated with the tusks of elephants but hippo is the second largest source of ivory. Hippo ivory does not yellow in the same way that elephant ivory does. For more information on ivory conservation refer to the Conservation Unit slide on the 96 Elephant Campaign.

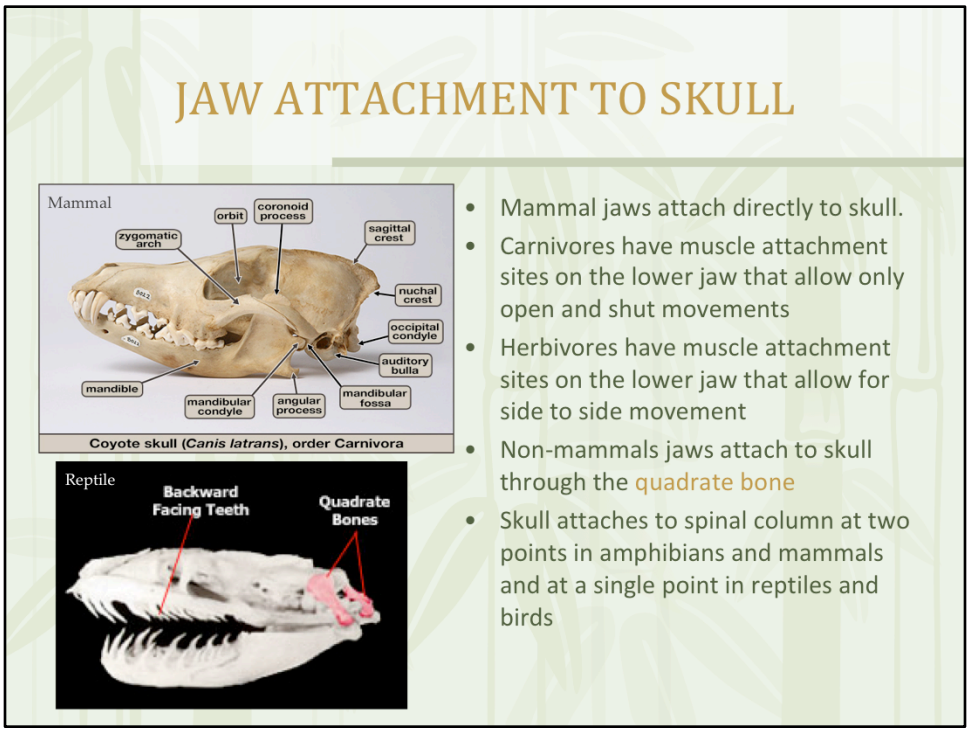


Skulls provide attachment points for the muscles an animal needs for chewing and biting. Animals that need stronger chewing muscles will develop larger bony attachment ridges for these muscles, such as the **sagittal crest** along the top of the skull and the **zygomatic arches** (cheek bones) on the sides. Predators that tackle large prey often develop a sagittal crest, since it provides attachment space for muscle, which is used to snap the jaws shut (upper red area of dog photo). The zygomatic arch also provides sites for muscle attachment and also to protect against strong blows to the face.

Sagittal crests are often larger in males than in females, because they are associated with larger body size. Look at the skull of the adult male gorilla. The prominent sagittal crest indicate exceptionally strong jaw muscles used for fibrous vegetation. Males and female gorillas have similar diets, so why don't females have a relatively prominent sagittal crest? In additional to the male being larger, his large sagittal crests may form in response to sexual selection and play a role in social signaling.

Herbivorous animals that do a lot of chewing to help break down the cellulose, have a larger muscle attachment sight on the lower jaw bone (lower red circle of cow photo). In ruminants, such as a cow, giraffe or antelope, this area is always large. If this attachment area is small, such as in a dog or cat, chewing is not a necessity and food is often wolfed down.

The tongue muscles are used by mammals to position food for chewing. Who do you think would have a larger tongue, a giraffe or a zebra? Ruminants, such as a giraffe, have very fleshy tongues to help move the ball of food around in their mouth when chewing. Zebras are not ruminants and need to eat a lot more to get the same nutrients that a giraffe does as they do not continually chew the same bit of food.



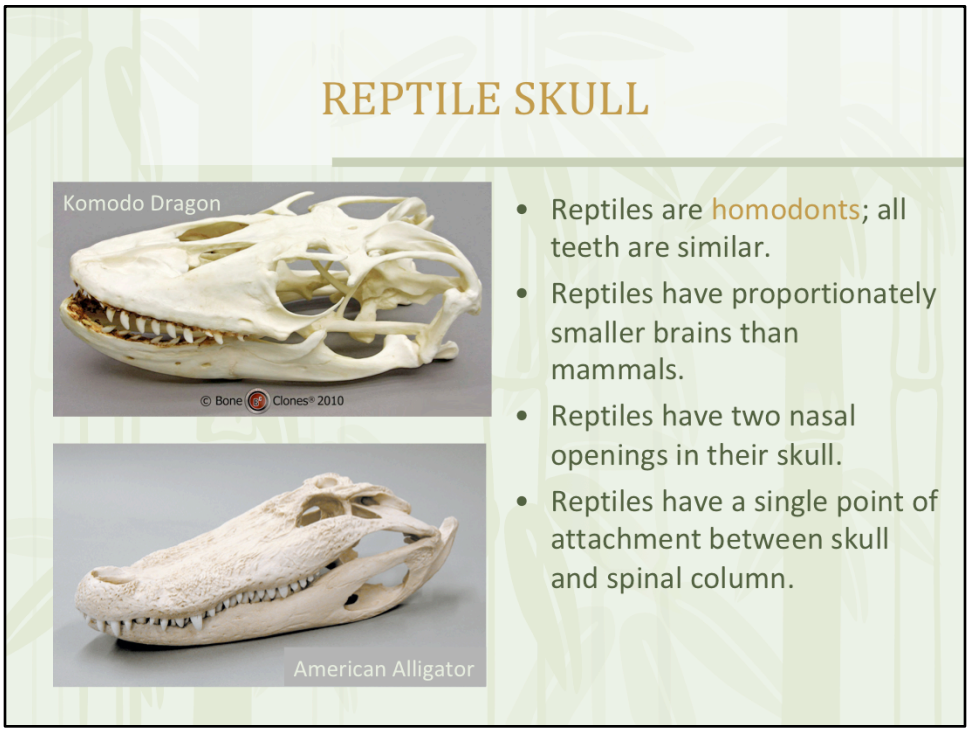
Mammals are the only vertebrates to have the lower jaw articulated directly to the skull. (see upper photo) In other vertebrates (i.e. amphibians, reptiles, & birds), the lower jaw is comprised of several different bones and is hinged through the **quadrate bone** to the skull. (see lower photo of snake) In mammals, this quadrate bone migrated to the inner ear and became one of the three middle ear bones and the lower jaw consists of a single bone. In snakes, the quadrate bone is elongated and works like a double-jointed hinge allowing the mouth to open as wide as 150 degrees.

The way that the lower jaw attaches to the skull also tells something about the animal's diet. **Carnivores** have a tight jaw joint, which is cupped or "C" shaped. This type of attachment to the skull allows for up and down movement, but little side-to-side movement. (see above photo where mandibular condyle attaches to mandibular fossa. Definitions for slide interpretation– **mandible**: jaw bone. **fossa**: an indentation in a bone; the socket part of a ball-and-socket type joint. **condyle**: the convex part of the joint; the ball part in a ball-and-socket joint).

Herbivores eat plants that are fibrous; plants must be ground and crushed into smaller pieces before they are swallowed. A herbivore's joint attachment is more open and shallow and the articulation between the lower jaw and skull is well above the plane of the teeth. The upper and lower molar teeth come together along the length of the jaw, when the mouth is closed, in order to form grinding surfaces. Although this type of joint is less stable than the hinge-type joint of the carnivore, the jaw is more mobile and allows the up and down and side to side jaw motions needed when chewing/grinding plant foods.

Omnivores have minimal side to side motion of their jaw, but a shearing action like the carnivores.

In mammals and modern amphibians, the skull is attached to the spinal column at two points of contact. Reptiles and birds have a single point of contact.



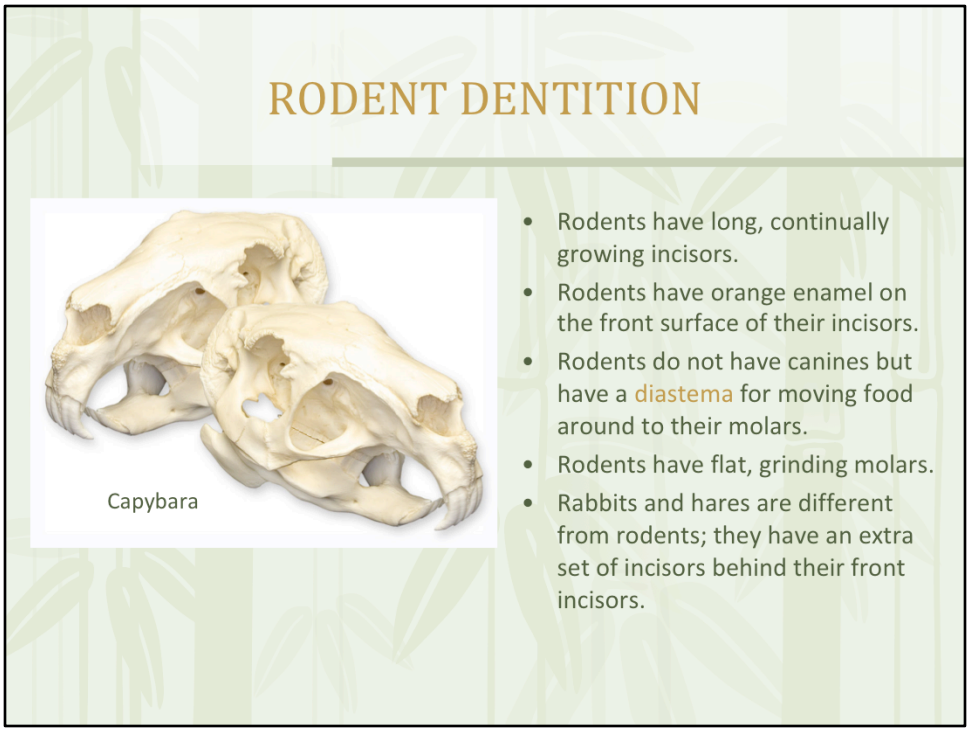
Reptilian skulls differ from mammalian skulls in a number of ways. The teeth of most reptiles are usually long, conical and are more or less uniform in size and shape, showing little specialization; reptiles are **homodonts**. Turtles, except for the earliest extinct species, lack teeth. Instead, they have upper and lower horny plates that serve to bite off chunks of food.

The lower jaw of a reptile is comprised of several different bones and is hinged to the upper jaw and skull through the **quadrate bone**. The large expansion of the jaw that this allows, enables the reptiles to swallow larger animals. The larger, carnivorous reptiles are equipped only to tear off or bite off large pieces of their prey and swallow them without chewing due to this jaw structure. **Insectivorous** lizards, which constitute the majority of all lizards, usually crack the exoskeleton of their insect prey, and then they swallow the prey without grinding it up.

Snake skulls are the most kinetic among the vertebrates; the highly mobile lower jaw and the quadrate bone, allow snakes to consume very large prey relative to their size. Snakes simply swallow their prey whole without any mechanical reduction, although the puncture wounds permit digestive enzymes to enter the prey to aid digestion. (**Note:** A mammal's lower jaw is a single bone and attaches directly to the skull)

Reptiles have two nasal openings in their skull, whereas mammals only have one. A reptilian skull is attached to the spine by a single point of contact (birds also have one point of contact, mammals and amphibian have two) The tuatara and most lizards also have a small hole, or "third eye" at the top of its skull. This **parietal eye** detects changes in light, and allows the animal to properly manage their heat. It also acts as a defensive mechanism, since an approaching predator will cause the light to change. Note: the parietal eye is especially visible on the common green iguana skull but not on the alligator skull on the komodo dragon biofact cart. Crocodilians lost this adaptation as have birds and mammals. If you are in the tropical building, you can use the plumed basilisk as an example of a lizard with a third eye. How do lizards change their body positions to heat up or cool down depending on the sunshine?

When compared with mammals, reptiles have proportionately smaller brains. Look also at the alligator skull on the komodo dragon cart. Look at how much space is used up, with teeth and their jaws, to help it to get and eat food. Who has more room for a brain, a mammal or the reptile?

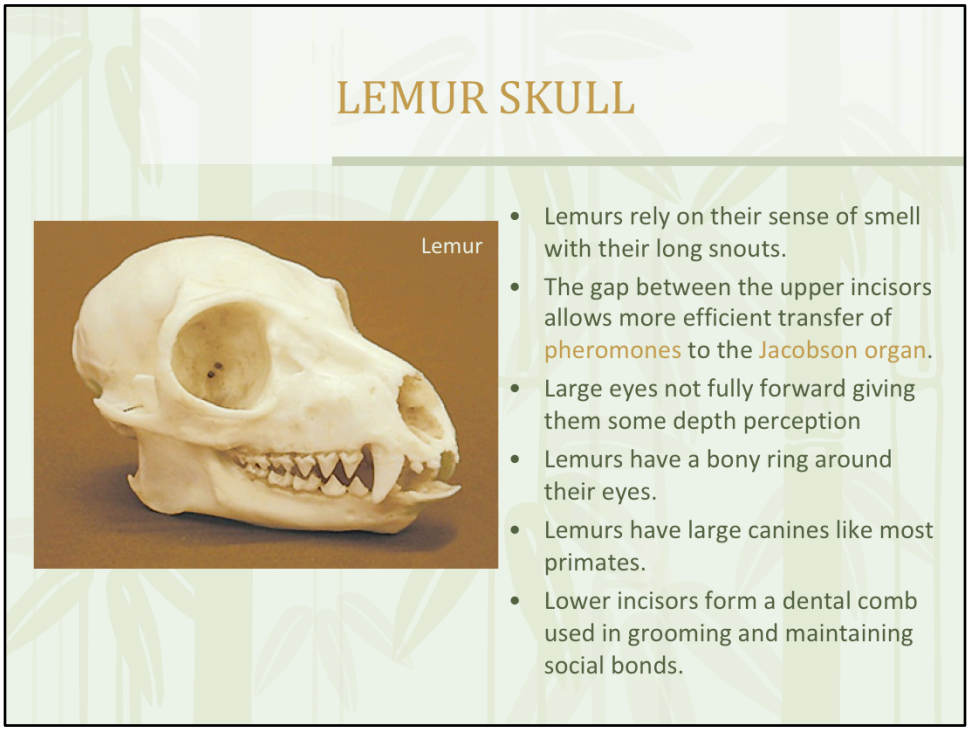


Rodents (Order Rodentia) have long, recurving (bending backward) incisors, no canines and flat grinding molars that is consistent with its herbivore diet. Rodents have a single pair of incisors on both the upper and lower jaw, which they use to chew through husks, shells and wood. This allows them to access well-protected or difficult-to-access foods, such as nuts. They are continuously growing and must be continually worn down through gnawing.

The anterior or front surface of the incisors has a coating of orange enamel. The front of the tooth is very hard compared to the back of the tooth, which is covered in dentin, a soft pulpy material. It's thought that this coloring is due to strengthening by the addition of iron and minerals. As the teeth are worn, the harder enamel persists while the softer material wears, giving them a characteristic chisel-like shape.

Rodents have a **diastema** between their incisors and molars. This is a gap that allows for food to be stored briefly in the cheeks making it possible for the animal to eat more food without stopping to chew and swallow each mouthful.

Hares and rabbits (Order Lagomorpha) are similar to rodents in that they also have continuously growing chisel-like incisors to gnaw and clip vegetation and a diastema. Rabbits also have hard enamel on the anterior surface of the incisors and a soft dentin behind, but the incisors of the rabbit are white and not orange like rodents. Hares and rabbits have another set of smaller teeth called peg teeth, against the back side of their incisors. When they bite down, the lower incisors match up with these peg teeth allowing the rabbit to make a clean, sharp cut through vegetation.



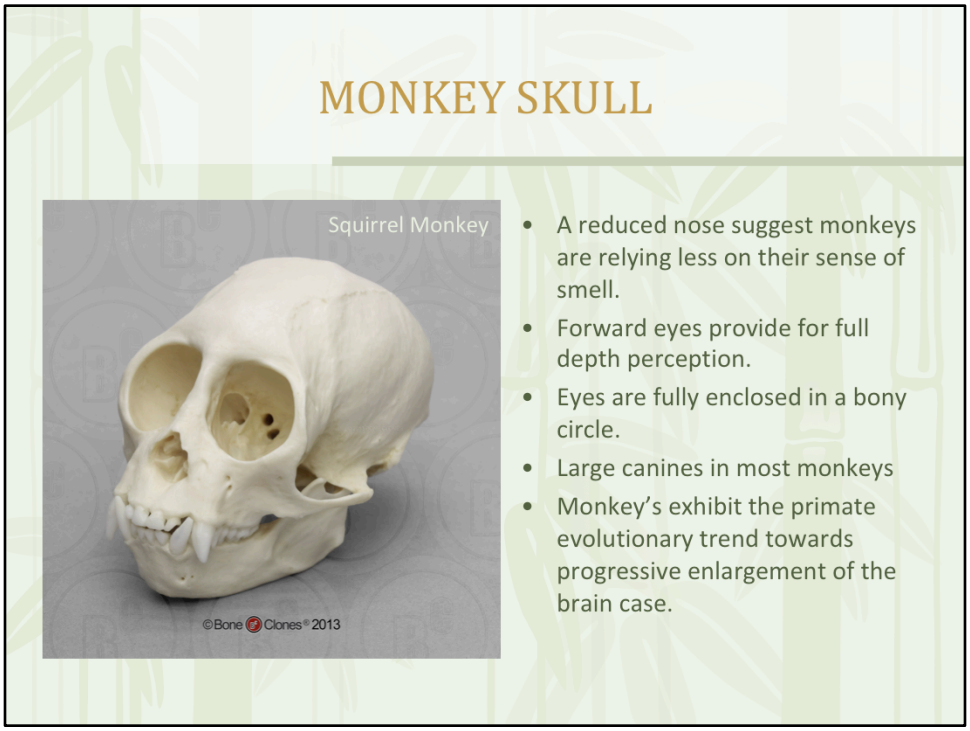
Prosimians are the most primitive of the primates. This group of primates, which includes lemurs, are the most reliant on their sense of smell. They have a long snout and their olfactory lobes of the brain are larger than in other primates (monkeys and apes). The longer snout with wet-nose leather serves to receive **pheromones** and transmit them up to the **Jacobson's organ** inside the nose. The small gap in between the front two incisors facilitates communication between their moist nose and their Jacobson's organ.

Lemurs have large eyes that are not fully facing forward but still gives them some depth perception, allowing them to move successfully through the trees in pursuit of food or when fleeing a predator. The large eyes reflect the nocturnal behavior of their ancestors; most lemurs have retained a reflective layer in the eye that allows the animal to see better in low light conditions (**tapetum lucidum)**.

Lemur eyes are surrounded by a bony ring (not a complete cup), which is open posteriorly. The bony ring helps to protect the eye from the mechanical stress that is exerted by biting and chewing. In carnivores, especially the cat species, who have a very strong bite force, the orbital ring is incomplete to prevent the eyes from popping out when using their chewing muscles.

Lemurs have large canines and the lower incisors that jut out creating a **dental comb**, a distinguishing feature of a lemur. The lower jaw is in two pieces (it is unfused) and held together by a ligament. The dental comb is used in grooming and reinforces social bonds. It can also be used to scrape resin or gum from the bark of trees. What other feature does the lemur have for personal grooming? They have a grooming claw on their second toe.

The **foramen magnum** is the opening in the bottom of the skull through which the spinal cord passes in order to connect to the brain. The position of this opening is a strong indicator of the angle of the spinal column to the head and subsequently whether the body is horizontal (quadrupedal) or vertical (bipedal). The position of foramen magnum is especially important in the primates. In lemurs, this opening is directed backward indicated a quadrupedal stance.



As we move from the lemurs to the monkeys you can start to see the trend in primate evolution moving towards an increase in vision and the reduced reliance on the sense of smell. Compared to the prosimians, monkeys have less fox-like snouts, larger brains, and increasingly more forward facing eyes. These and other anatomical features suggest that the early monkeys were becoming mostly diurnal, fruit and seed eating, forest tree-dwellers.

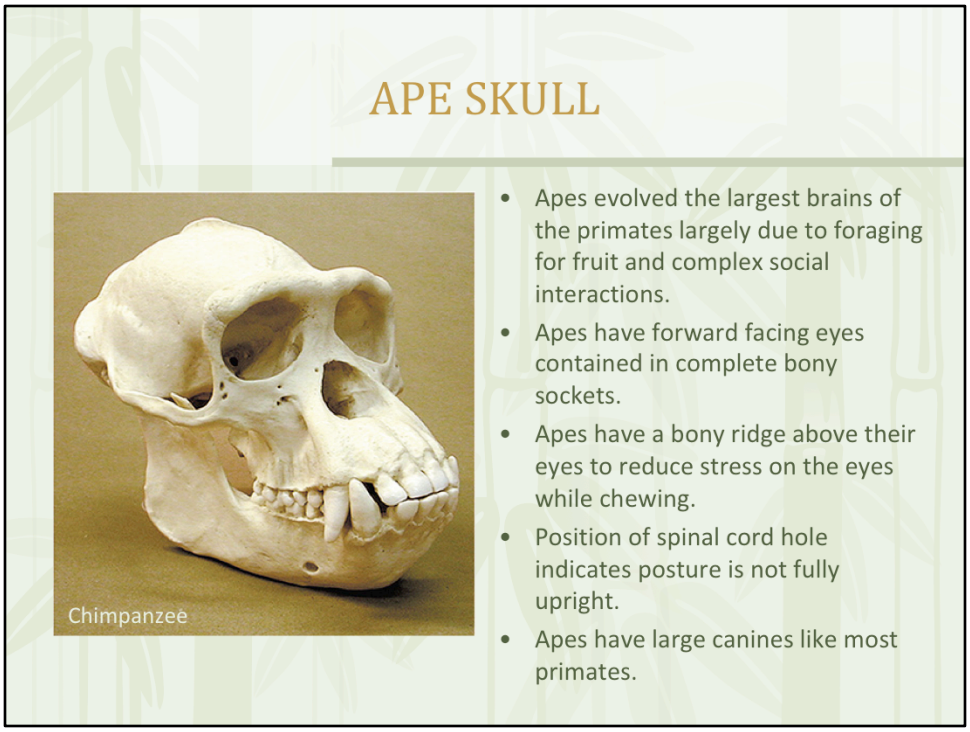
Monkeys have forward facing eyes. The reduced size of the nose permits the eyes to migrate to a more forward position on the face, creating **binocular vision**, where both eyes are used together allowing a wider field of view. The reduced size of the nose permits the eyes to migrate to a more forward position on the face. The shortened muzzle prevents the nose getting in their visual field but, reduces smell perception. The vision from each eye overlaps (**stereoscopic vision**) resulting in **depth perception**. Depth perception is extremely useful for forest-dwelling primates, as it lets them judge how far away the next branch is as they are moving from tree to tree. Compare the structure and position of the eyes and the length of the nose of a squirrel monkey to that of a lemur.

If you look at the skull of a monkey (and apes), the eye socket (orbit) is walled off posteriorly, creating a cup, insulating the eye from the movements of the chewing muscles. This is in contrast to the lemurs, who have a bony ring around their eyes and most mammals, who have an incomplete socket.

The position of the **foramen magnum** indicates if the animal walks two or on four legs. This opening is variable in the different monkey species, but the trend from lemurs to monkeys and finally to apes and humans is that the opening moves downward and forward.

In Old World Monkeys, skulls of males and females may differ in size (**sexual dimorphism**); the skull of the male may be twice as heavy as the skull of the female and have larger canines, which they use for defense and competing for females. New World Monkeys do not exhibit this sexual dimorphism, with the exception of the howler monkeys. The mandrill, an Old World Monkey, is a good example of sexual dimorphism exhibited by the male in its larger body size and longer canines than the female. Use the male and female mandrill skulls on the monkey cart to show this.

Consider the evolution of primates. Why are their brains becoming larger? What areas of the brain are becoming more important? Why is color vision becoming more important in these more **frugivore** primates? How does the ability to select ripened fruit enhance the specie's ability to survive? Color vision allowed the primates to see when fruit is ripe. Vision and increasingly complex social relationships and interactions are an important aspect of primate's development.



Apes have a larger brain to body size ratio compared with other animals. Apes have a more complex social life, greater visual demands, and they developed color vision most likely due to their diet of fruit. The animal must remember where and when the best fruit is likely to grow and when it will be available to them for food. These selective pressures may all have led to a larger, more complex brain in the apes. Compare the brain case size of a lemur, monkey and ape? Do you see the evolutionary progression towards a larger brain in these primates?

Apes rely on vision rather than smell, and thus have flattened faces with complete and forward pointing bony sockets, which are separated from the jaw muscle. A bony ridge above the eye sockets reinforces weaker bones in the face, permitting apes to consume a tough, fibrous diet.

The **foramen magnum**, of an ape, has moved downward and forward compared to a monkey's. This arrangement allows the eyes to face forward when the body is upright. In humans, the opening is positioned in the center of their skull, resulting in an erect stance. All apes are capable of bi-pedal walking, but only humans are bi-pedal all of the time. Apes are most comfortable knuckle walking.

Primates also have a reduced number of teeth as compared to other mammals. Apes have the same dental formula as Old World monkeys. The large canines of apes are sometimes used for defense and in competition for females.

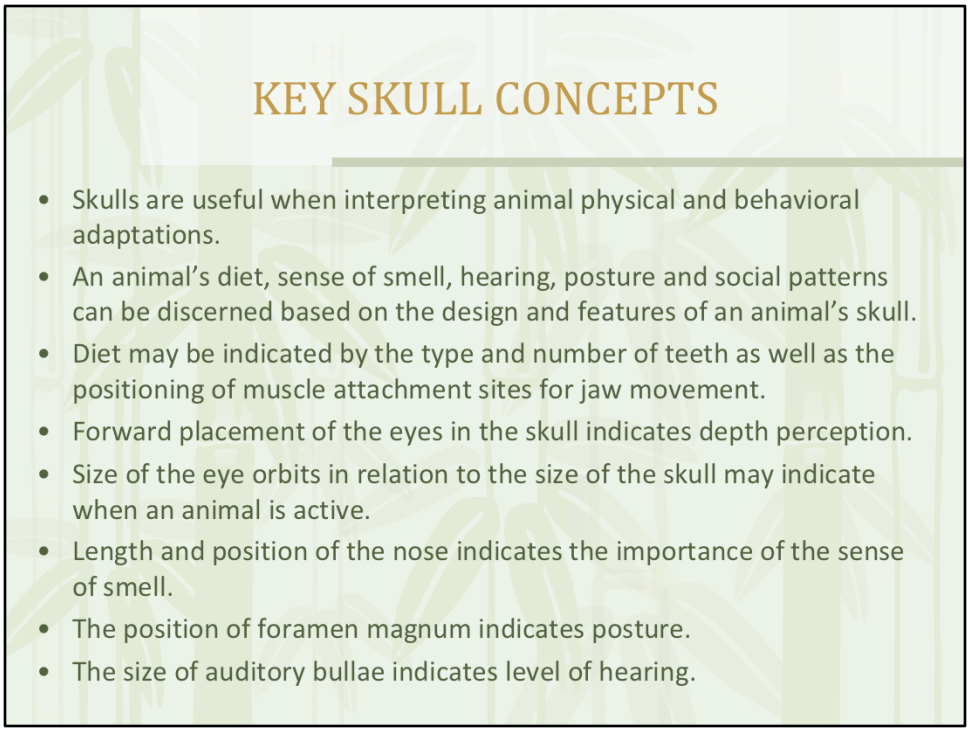
Antlers are extensions of the skull grown by members of the deer family. They are true bony structures that usually grow in symmetrical pairs and are branched. In most species, only males grow antlers and their primary function is competing for females. The exception is that female caribou and reindeer have antlers but retain them longer than the males to help protect their young. **Velvet,** a covering of skin with soft fine hair, provides the antler with blood carrying oxygen and nutrients that it needs to grow. Once the antler has achieved its full size, the velvet is shed and the antler's bone dies. This dead bone structure is the mature antler. Antlers are shed annually at the end of the mating season, and regrown starting in the spring. The zoo has southern pudú, whose male grows short, spiked antlers that are not forked. Seasonally the zoo brings in reindeer, which are domesticated caribou.

Horns are found on the heads of most ruminant species including cattle, sheep, antelopes, giraffe and goats. Horns are permanent, ever-growing, and do not regenerate if injured; they are unbranched (exception: pronghorn). In species where both sexes have horns, the males' are generally larger. A horn has an inner bony core and the outer sheath, which is made of keratin. The zoo has many horned animals including greater kudu, bongos and several species on the Family Farm.

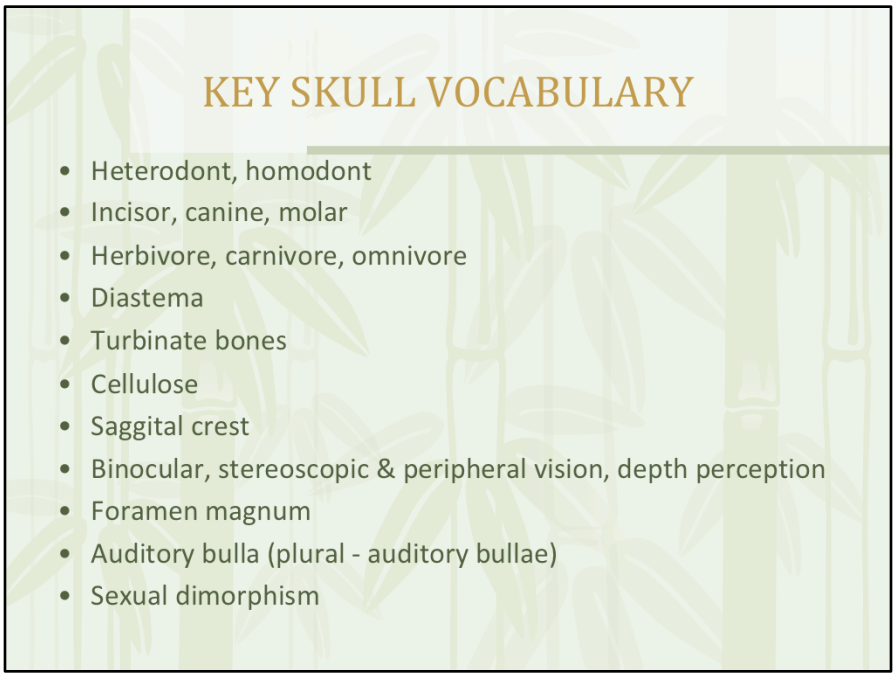
A **giraffe** is born with cartilaginous horns that calcify after birth. These bony outgrowths or **ossicones** are permanent and remain covered with skin and fur. What purpose do ossicones serve? They are not used to test strength and dominance. The theory is since giraffe's ancestors had antlers, these structures served as support for antlers. As giraffes grew, frontal assaults were replaced by swinging their long necks and striking a blow with their head.

A **rhinoceros** horn is composed of solid keratin fibers and is regenerated through continuous growth. The horn costs as much or more than gold on the black market; rhino horns fetch up to $100,000 /kg. The Asian rhino horn is favored over the African horn as it is smaller. The horn is used for Asian medicines and ceremonial dagger handles. Talking about the rhino horn is a great way to talk about conservation efforts of the black rhino and the greater one-horned rhino of the zoo and also not buying products made from certain wildlife goods.

Animals with horns may be exposed to higher hunting pressures and therefore may influence their conservation status. Species with horns are usually listed as endangered. Trophy hunting has been severely restricted by **CITES** (Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments.



Corresponds to the Biofact Study Guide In the Docent Notebook. For specifics on the Zoo's biofact bags and carts read the individual Biofact Talking Points in the Docent Notebook



Definitions:

Auditory bulla: bony capsule, which encase parts of the inner ear.

Binocular vision: vision in which both eyes are used together; this gives a wider field of view.

Canine: any of the pointed conical teeth located between the incisors and the first molars.

Carnivore: an animal that gets its energy from eating other animals.

Cellulose: an organic compound that forms the main component of the cell walls of plants; it gives wood its remarkable strength.

Depth perception: visual ability to perceive the world in three dimensions and the distance of an object.

Diastema: a space or gap between two teeth.

Foramen magnum: opening in the bottom of the skull through which the spinal cord passes in order to connect to the brain

Frugivore: an animal that eats mostly fruit.

Herbivore: an animal that gets its energy from eating plants, and only plants.

Heterodont: animals which have different kinds of teeth; for example, most mammal teeth are differentiated into incisors, canines and molars.

Homodont: animals whose teeth are all of the same type; for example, most vertebrates except mammals have a single tooth morphology.

Incisor: any of the anterior teeth in each jaw, used for cutting and gnawing.

Insectivore: a carnivorous plant or animal that eats insects.

Molar: a grinding tooth at the back of a mammal's mouth.

Omnivore: an animal that eats both plants and animals.

Peripheral vision: side vision; what is seen on the side by the eye when looking straight ahead.

S**agittal crest:** a ridge of bone running lengthwise along the midline of the top of the skull.

Sexual dimorphism: the differences in appearance between males and females of the same species, such as in color, shape, size, and structure.

Stereoscopic vision: The single perception of a slightly different image from each eye, resulting in depth perception.

Tapetum lucidium: a reflective layer of tissue in the eye that reflects light causing the eyes to glow when light strikes them at night. It is chiefly a characteristic of nocturnal animals (i.e. cats)

Turbinate bone: delicate bones in the nasal cavity that direct the flow of air through the nasal passages and heighten the sense of smell. Turbinates are covered with mucous membranes, which warms and moistens the incoming air.