



Talking Skulls Lab

What can a skull tell you? A lot! If you look at a skull for clues about its origin, not only can you identify what species it might be from, but also many details about that original animal.

In this lab, you will learn what clues to analyze in order to find:

- the approximate length (including the tail) of the original specimen the skull came from
- whether it was a predator or a prey species
- what it likely preferred to eat (herbivore, omnivore, carnivore)
- its trophic level (primary, secondary, or tertiary consumer)
- whether it walked on 2 or 4 legs
- how powerful its jaws were
- how well it could see... and more!

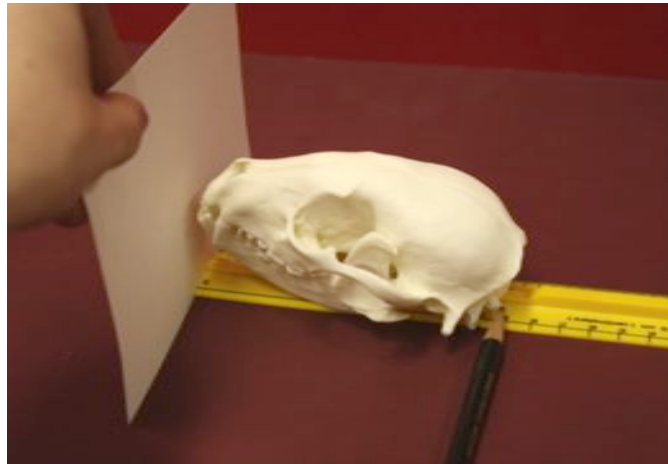
There are several different characteristics you will need to pay attention to. Record your data and observations on your **Skull Identification Worksheet**.

You will work with these skulls!

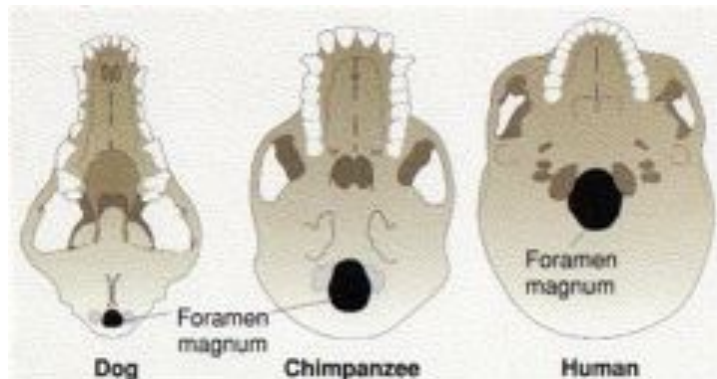


1. Measure the length of the skull in centimeters.

- a. Place a ruler underneath the bottom of the skull, lengthwise.



- b. The front of the snout or beak should be at the very edge of the ruler. (You may want to push the snout or beak up against a book or index card, like in the picture above.)
- c. Find the **foramen magnum**, the opening in back of the skull where the spine enters the skull. See the diagram below:



Measure from the end of the snout or beak to the foramen magnum, and record the result in centimeters (cm) in **column (a)** of your worksheet. Make sure you use the correct row (letters A through H) for the skull you are examining.

- d. Have your partner repeat the exact same procedure you did and record his/her result (in cm) in **column (a)**.
- e. Average yours and your partner's results and write the average in **column (a)**, inside the small box.

2. Estimate the total length of the original specimen.

- a. Multiply the average length of the skull from the small box in **column (a)** times 5 and record this number in **column (b)** of your worksheet. This is the estimated length of the original animal that the skull came from, including its tail.
- b. Use the ruler to measure this length along the piece of rope provided. Cut the rope to the correct length. This will help you visualize how long the specimen really was!
- c. At the end of the lab, you will place all these different rope lengths side-by-side and compare each species.

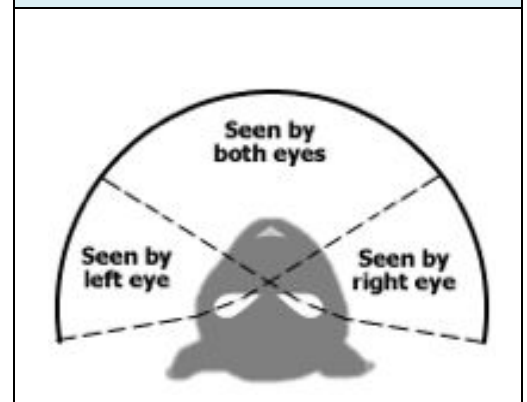


**EYES IN THE FRONT, GO OUT AND HUNT!
EYES ON THE SIDE, GO OUT AND HIDE!**

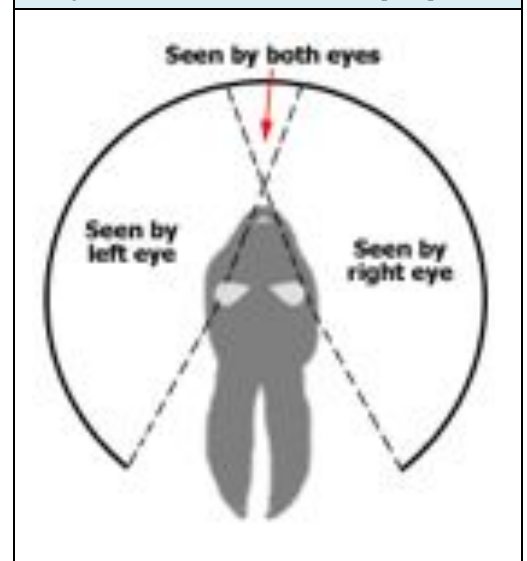
2. Was your specimen a predator or prey?

- a. Look at the position of the eye sockets. Are they mostly in the front, facing forward? This would have given your specimen better binocular vision and depth of perception. These are important for predators so they can gauge how far away their prey is and whether they can easily pounce to catch it.
- b. If the eye sockets are mostly off to the side and top of the head, your specimen might have been a prey species. Eyes facing out to the sides allow the animal to have better peripheral vision and a wider range of view.

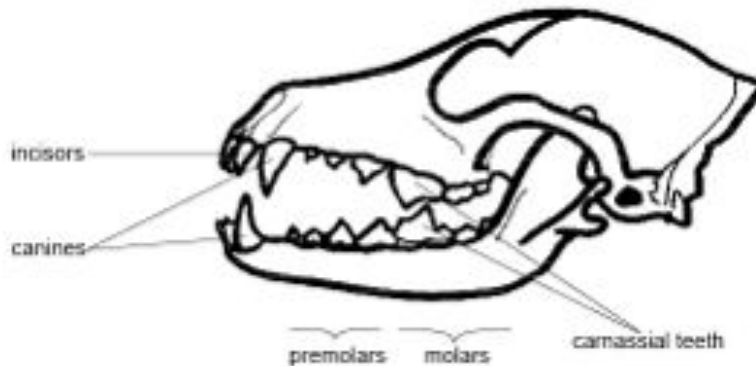
Predator field of vision: mostly forward



Prey field of vision: wide and peripheral



- c. What teeth does the animal exhibit? Remember the 4 most important types of teeth and learn how to identify them. See the diagram below:

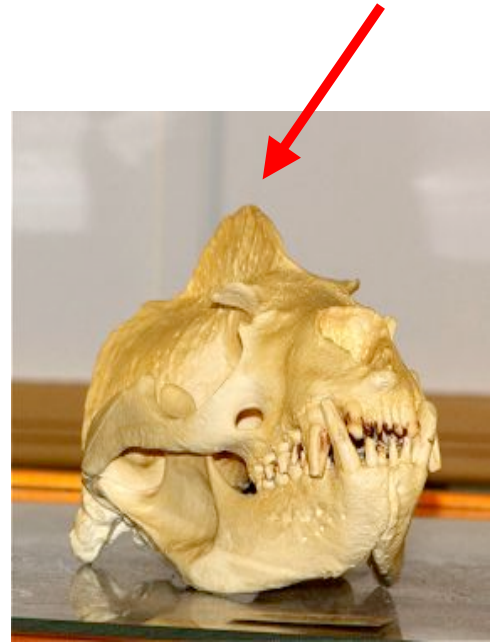


(Note: **carnassial teeth** are scissor-like teeth used by carnivores to shear the meat off their prey.)

- d. **Herbivores** (prey animals) have flat molars used for grinding plant food. They might have small canines, or no canines at all, and small incisors. There is usually a large gap between the incisors and the premolars. Since their food doesn't try to escape, they use their front teeth (incisors) like sheers to prune the plant material.
- e. **Carnivores** (predators) eat mostly meat and their teeth are adapted accordingly. They have all four types of teeth and some of them also exhibit carnassial teeth. They have large canines in the front of the mouth used to pierce through and hold their prey. Their molars and premolars are sharp and pointy and used to cut and tear flesh. Large canines, sharp molars and carnassial teeth indicate that your skull belonged to a carnivore.
- f. **Omnivores** are animals that can eat both meat and plants. They have all four types of teeth. The teeth in the front of the mouth are sharp, but their molars are flattened and wide. If your skull has a combination of sharp front teeth and flat molars in the back, your specimen was probably omnivorous.

4. Does the skull have a sagittal crest?

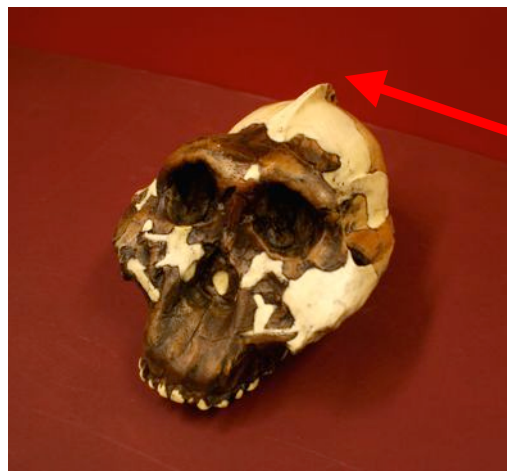
Skulls are made of separate bones that look like plates. In some animals these plates meet at the top of the skull and form a ridge. This ridge is called the **sagittal crest**, and runs the length of the skull. (Follow the arrow in the picture to the right.)



The sagittal crest is a point of attachment for the muscles that run from the top of the head to the jaw. These muscles are responsible for controlling the crushing lower jaw.

The larger the sagittal crest, the more powerful muscles of the jaw and the bite of the animal. The picture above shows the large sagittal crest of a California sea lion.

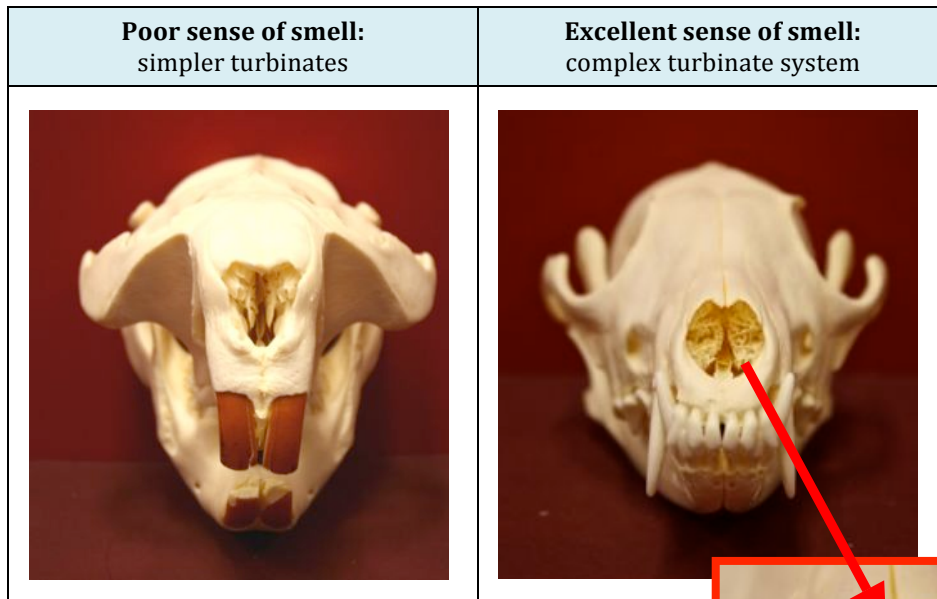
Predators have larger sagittal crests than prey animals. Small sagittal crests are usually present in omnivore species such as coyotes, raccoons and beavers. Because most herbivores have smaller jaw muscles, they do not have a sagittal crest.



This replica of a *Paranthropus boisei* skull, an early human ancestor (or hominid), must have had strong jaw muscles, but was not a serious predator like the sea lion, shown above.

5. What kind of sense of smell did the specimen have?

- a. The nasal cavity of the skull will give you information about the animal's sense of smell. Look inside the nose of the skull. The thin membranes you see are called the **turbinates**. The more complex these structures are, the better the sense of smell the animal had.



- b. Also, look at the length of the snout. The longer the snout, the better the sense of smell of the animal.

Skulls that have long snouts and large turbinates indicate that the ability to smell was very important for the survival of the animal.

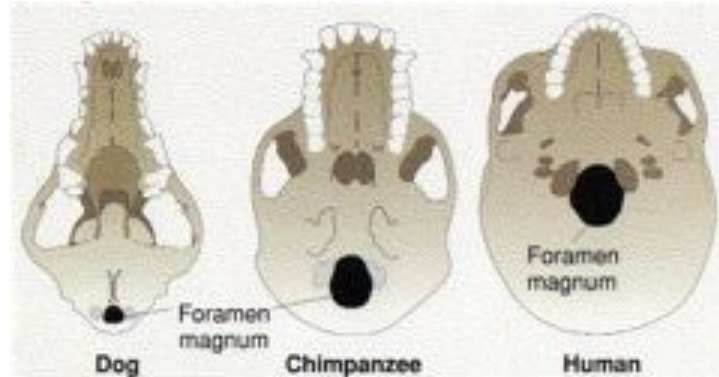


Look at the dog (left) and cat (right) skulls. Which one do you think has better sense of smell than the other?





6. Did your specimen walk on 2 or 4 legs? Or did it alternate at different times?

Look again at the **foramen magnum** of your skull, where the spinal cord enters the skull. Compare it to the dog, chimpanzee and human foramen magnums in the diagram below:



You will use a wooden dowel to give you a better idea of how the head was positioned in the body of the animal. This, in turn, will help you determine if the animal walked on 2 or 4 legs.

In humans, and other animals that walk on 2 legs, the foramen magnum is found underneath the skull. In animals that walk on 4 legs, the foramen magnum is located towards the back of the skull.

<p>In this human skeleton, the foramen magnum is located underneath the skull.</p>	<p>In this coyote skeleton, the foramen magnum is located towards the back of the skull.</p>
	

Now, locate the dowel at each skull station. (Use the dowel that is labeled with the SAME letter as the skull.)

CAREFULLY insert the TAPE-COVERED end of the dowel into the foramen magnum of the skull. Insert until the EDGE OF THE TAPE meets the opening of the foramen magnum. See the picture sequence below: (Please be gentle, and do not push the dowel far into the skull!)



Does the dowel extend straight backwards (horizontally) from the skull? Or does it point down underneath the skull (vertically)? The angle that you get will give you an idea of whether your specimen walked with 2 or 4 legs.

NOTE: Sometimes animals that we typically think of as 4-legged can actually stand on 2 legs. Will this make a difference in the angle?

7. How good was your specimen's vision?

The size of the skull's eye orbits, or eye sockets, in relation to the size of the body can tell you how important vision was to your specimen. The larger the orbits, the sharper the vision your animal had.

Very large eye sockets are typical of nocturnal animals (active at night). In this case, larger eyes are an adaptation to see better in the dark.



Look at the picture on the right. The eye orbits are very large. This particular animal had very, very good sight and was nocturnal.

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- Page 2, Page 8: “foramen magnum”
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- Page 3: “ruler, scissors, and yarn”
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- Page 4: “fields of vision”
<http://www.peteducation.com/article.cfm?c=2+2083&aid=1596>
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- Page 8: “coyote skeleton”
<http://www.taxidermy.net/forum/index.php?action=dlattach;topic=282811.0;attach=134484;image>
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