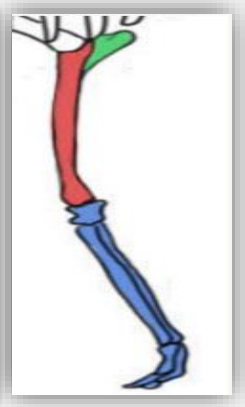
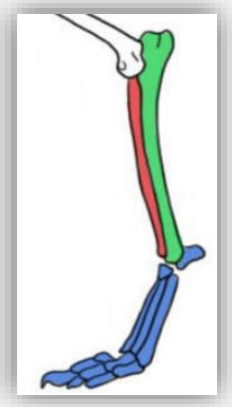
CH.2 – INVESTIGATING BODY STRUCTURE DIFFERENCES





dire wolf

fruit bat

1 WARM UP
Warm-Up

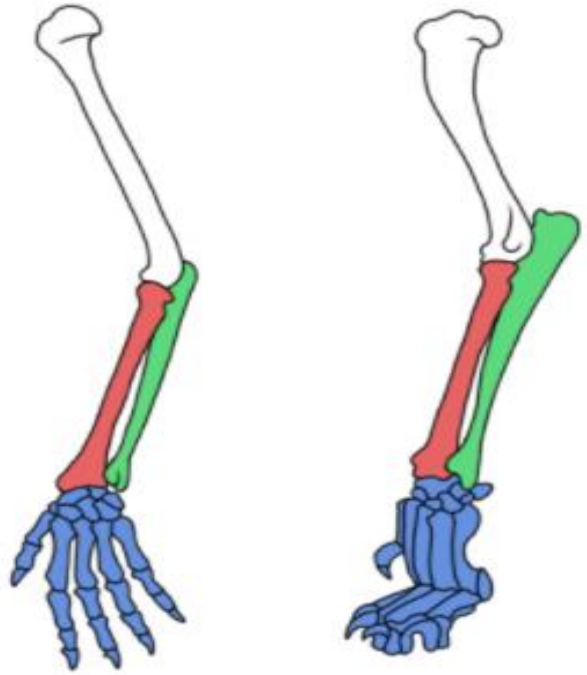
EH: 2.1.1 WARM-UP

Students practice making careful observations by looking for differences in the bone structures of human and cat front limbs. (10 min)

Differences in Body Structures

Work independently to answer the following questions.

This illustration shows the front limbs of a human and a cat (a human arm and a cat's front leg). Both have the same bones, but these bones look very different in the human and the cat.



Human

Cat

1. Radius
2. Ulna
3. Distal Bones

Using careful observation, describe at least two differences between these two limbs. Start with the hand bones.

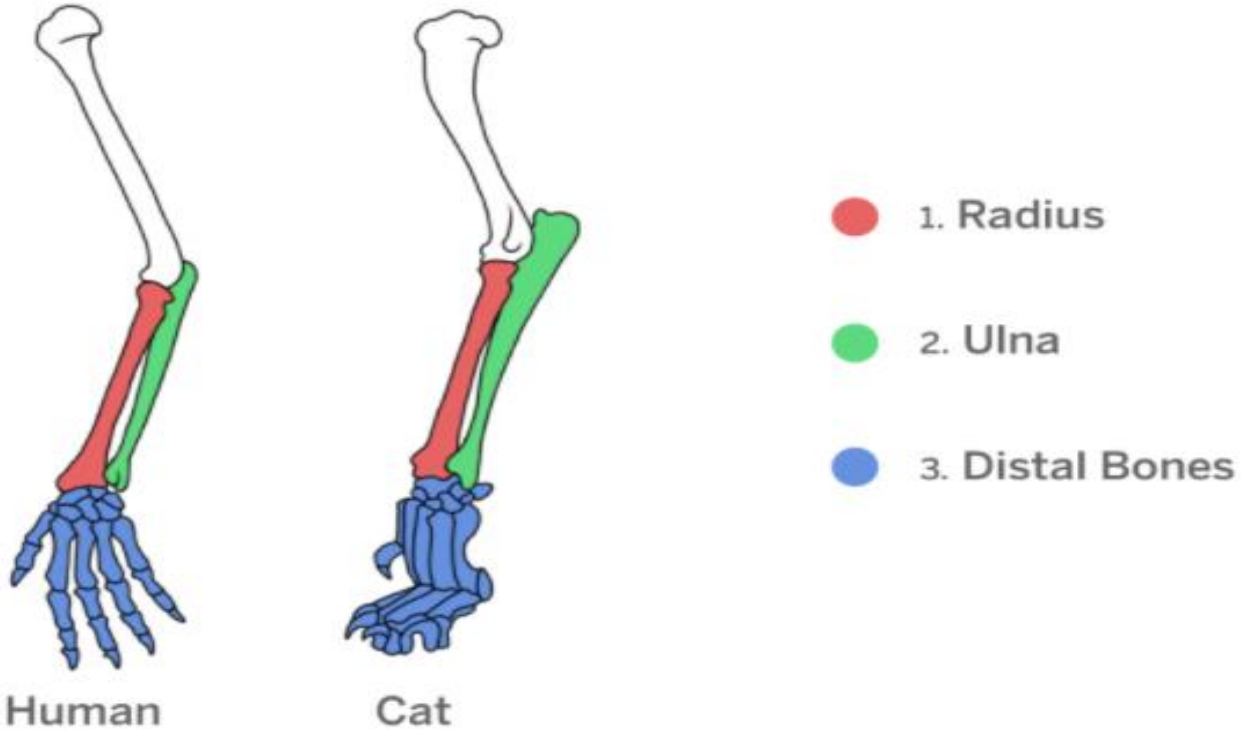
ANSWER HERE…

THEN HAND IN

1 WARM UP
Warm-Up

EH: 2.1.1 WARM-UP

Let's share your observations from the Warm-Up.



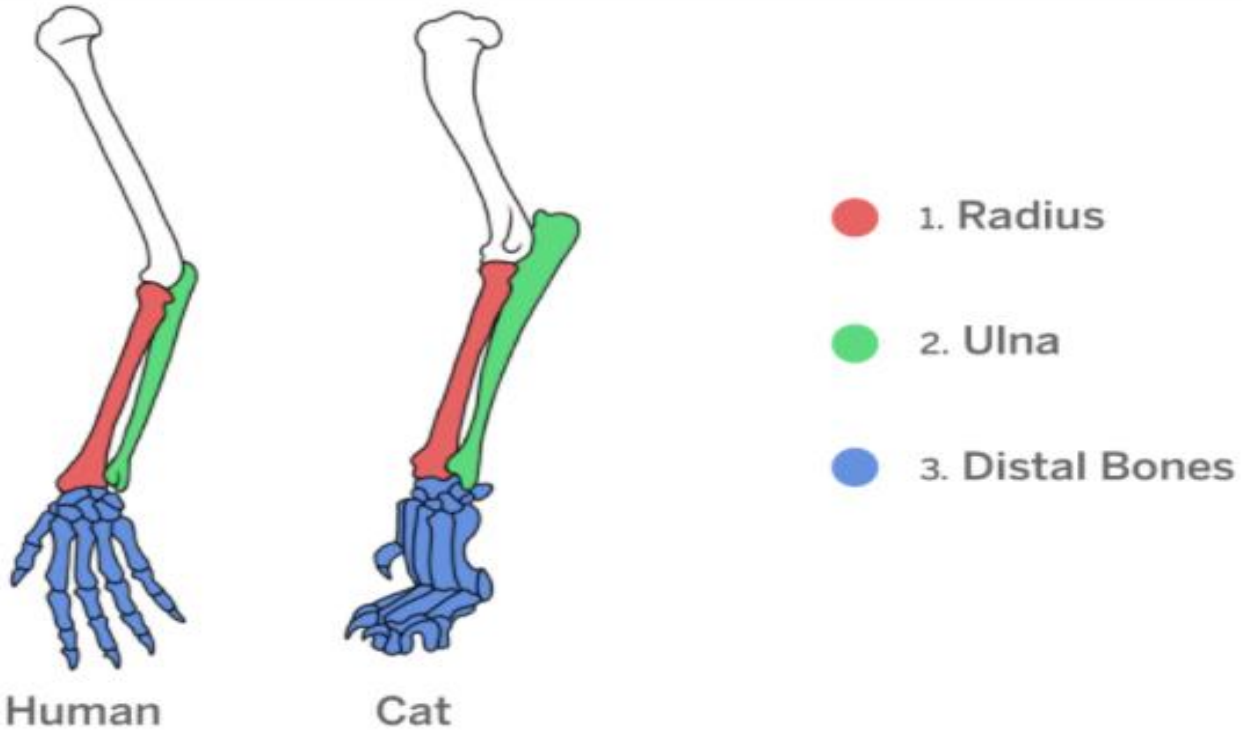
Using careful observation, describe at least two differences between these two limbs. Start with the hand bones.

We can see that cats and humans have many similar bones, even though they look very different. Why do cats and humans have similar bones?

Because they share a common ancestor population.

1 **WARM UP**
Warm-Up

EH: 2.1.1 WARM-UP



In the Warm-Up, you were asked to make observations about the *differences* in their shared structures.

Why do you think a cat and a human would have differences like the ones you observed?

Answers will vary but might include that humans use their front limbs to pick things up, whereas cats use their front limbs to hunt and run around on all four legs.

We will spend the next few lessons learning how and why differences in species happen.

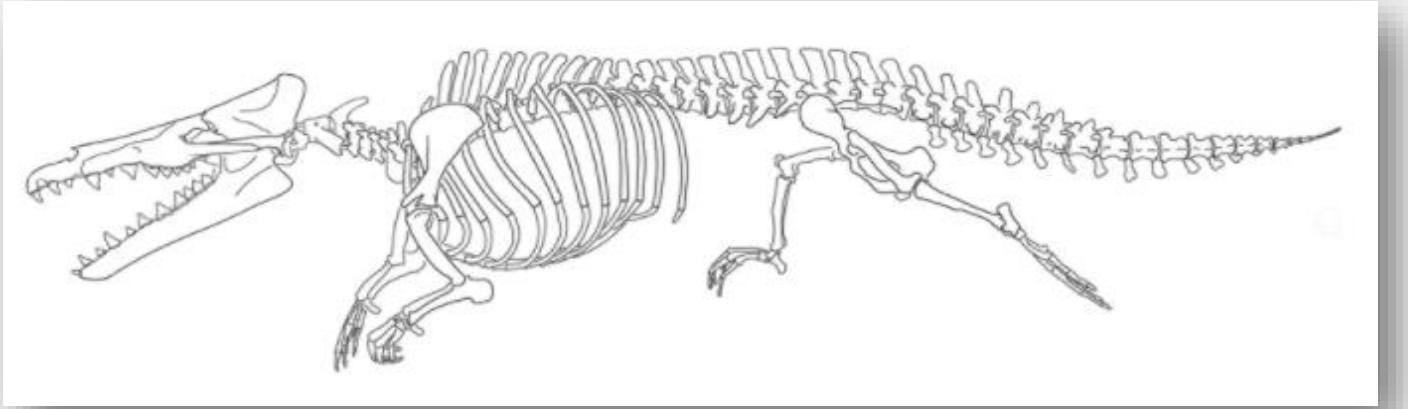
1 WARM UP
Warm-Up

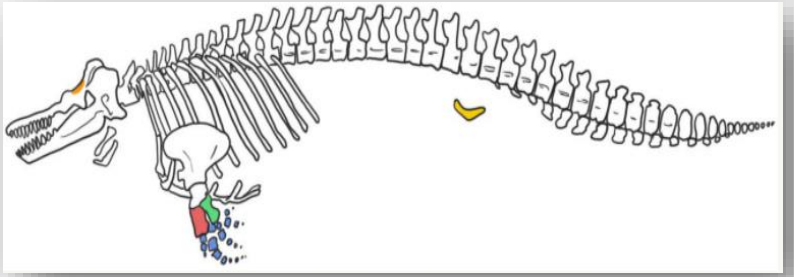
EH: 2.1.1 WARM-UP

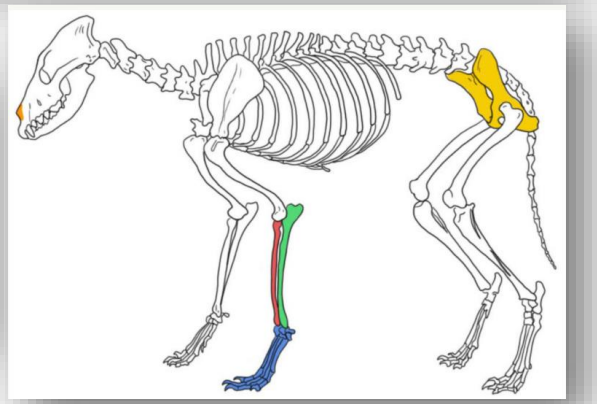
Let's examine the 2 remaining claims on the Claims chart and look at the similarities and differences.

When we think about the problem we are trying to figure out…

—where in the museum to place the Mystery Fossil—







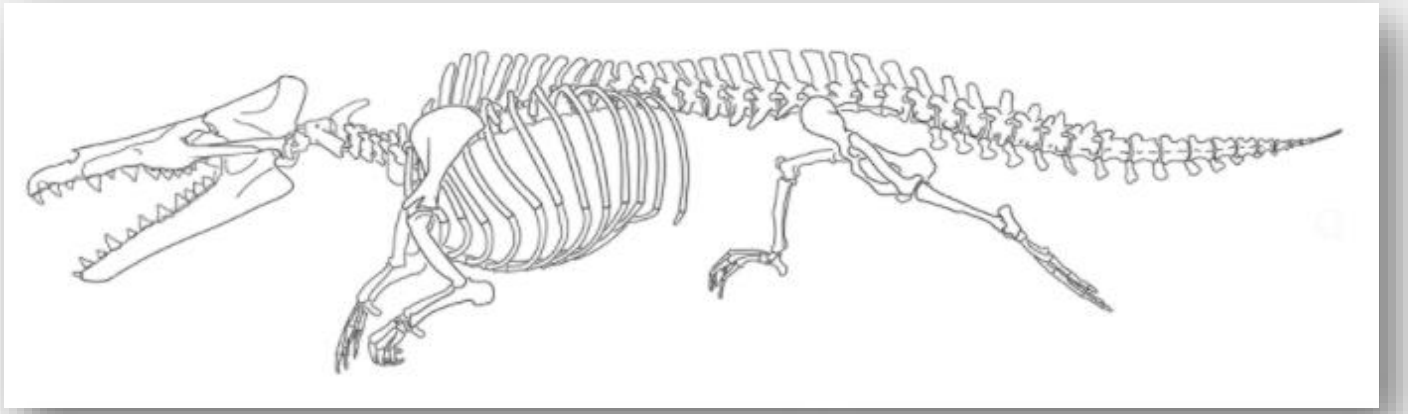
…we can see that whales, wolves, and the Mystery Fossil all have shared structures, such as skulls, backbones, and front limbs.

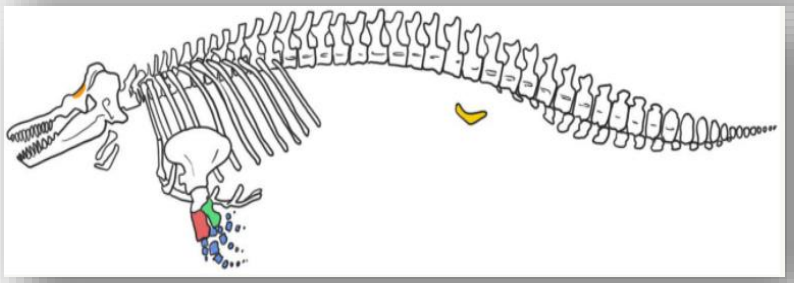
These shared structures provide evidence that these species share a common ancestor, just like the cat and human do.

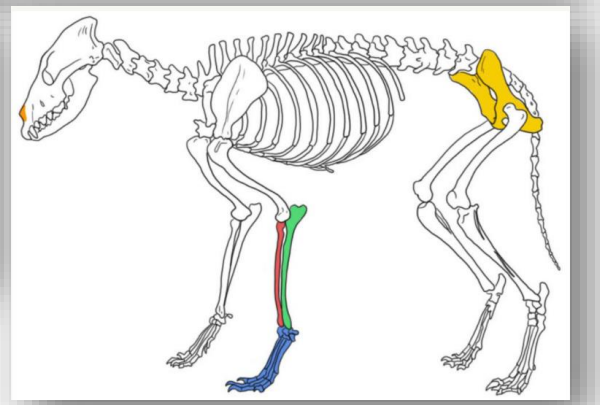
1 WARM UP
Warm-Up

EH: 2.1.1 WARM-UP

Let's examine the 2 remaining claims on the Claims chart and look at the similarities and differences.







What we don't know is this:

- Why do these shared structures look so different?
- Why, if they all evolved from the same common ancestor, are the shared structures of front limbs shaped so differently in whales, wolves, and the Mystery Fossil?
- What caused these differences to occur?

1 WARM UP
Warm-Up

EH: 2.1.1 WARM-UP

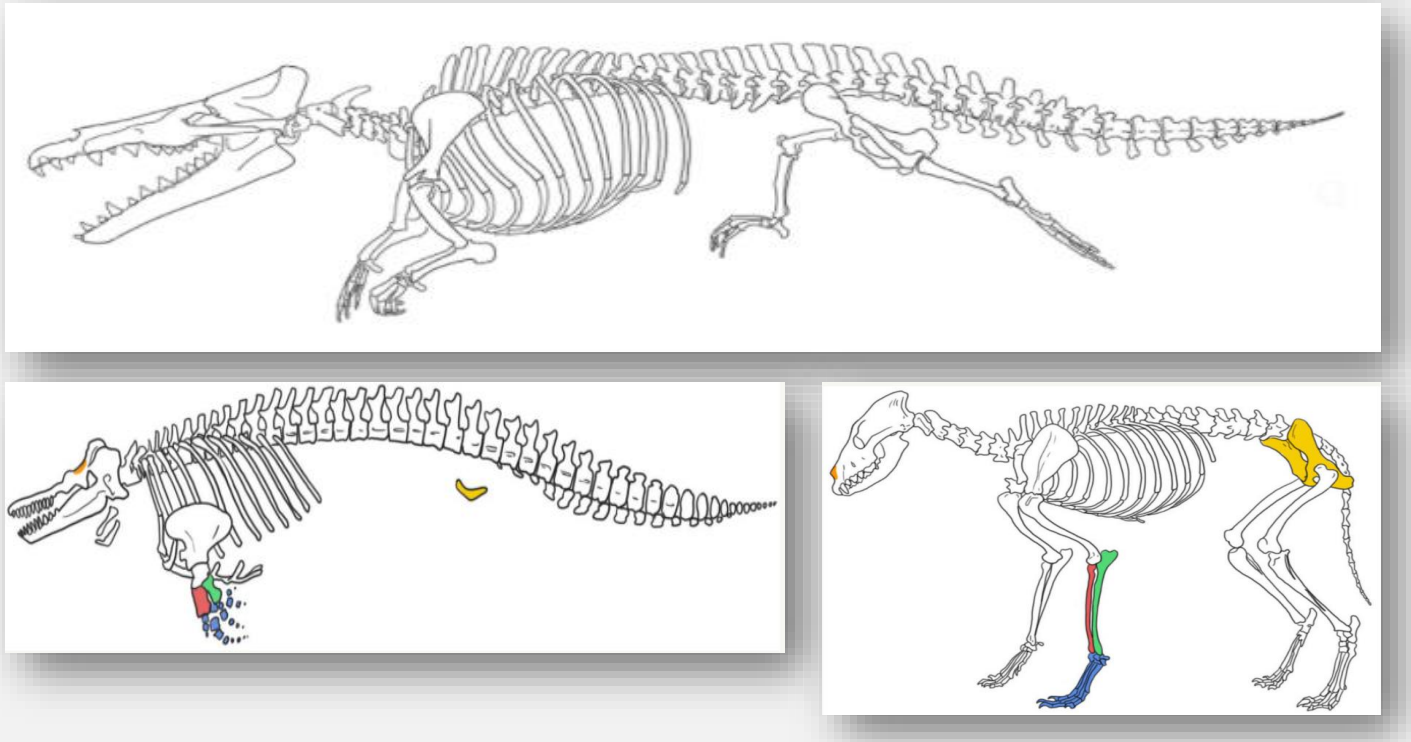
Chapter 2 Question.

How did wolves, whales, and the Mystery Fossil become so different from their common ancestor population?

Investigation Question.

How does an ancestor population evolve into descendant species with differences in their shared structures?

Understanding why shared structures of related organisms—like the front limbs of cats and humans, or the body structures of the whale, the wolf, and the Mystery Fossil—are so different is very complex!



We will start to learn some of the reasons why through our investigation today.

1 WARM UP
Warm-Up

EH: 2.1.1 WARM-UP

What are Adaptive Traits?

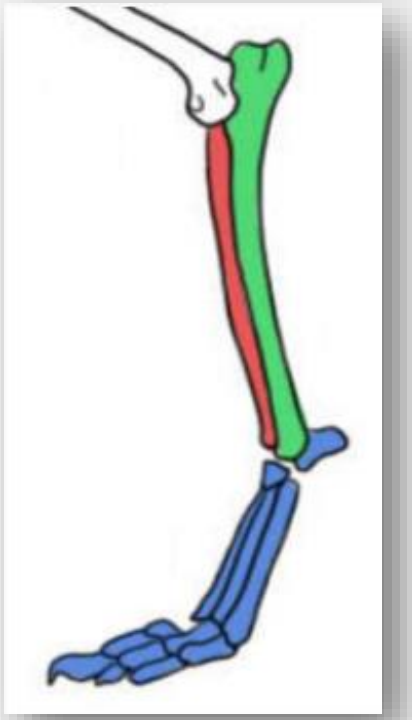
When you learned about natural selection, you learned the term *adaptive trait*.

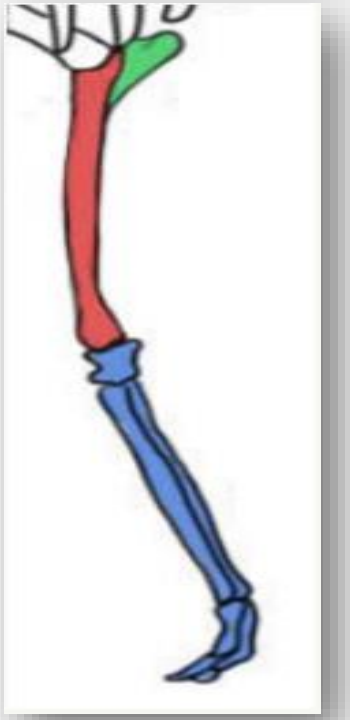
This term is helpful when thinking about why a limb looks the way that it does.

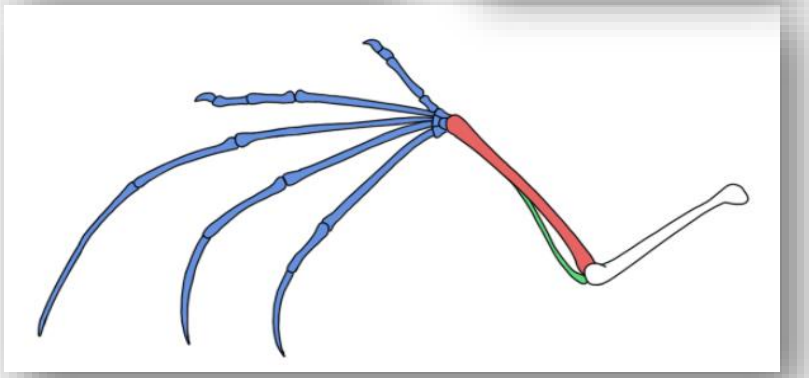
The shape of a structure is a kind of trait.

Another way to think about why a limb is shaped the way it is, is to ask,

Why might the shape of this limb be an adaptive trait for this animal?



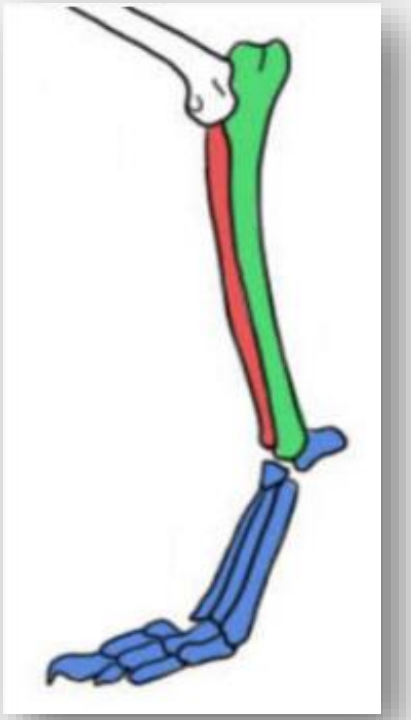


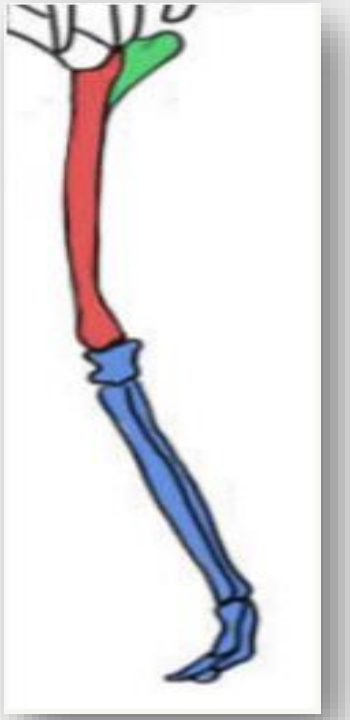


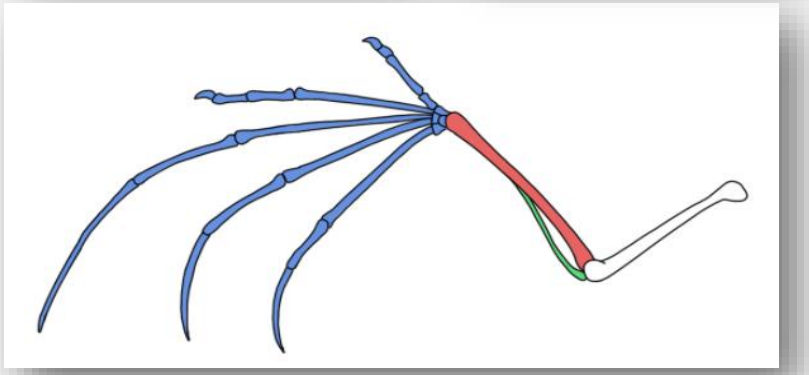
1 WARM UP
Warm-Up

EH: 2.1.1 WARM-UP

What are Adaptive Traits?







You gave some good suggestions for why the shapes of the cat and human front limbs are adaptive traits for each species.

Remember that an adaptive trait is a trait that helps an organism to survive and reproduce in its environment; because of this, adaptive traits become common in a population over time.

Let's review the term *environment*.

An organism's environment includes all the living and nonliving things that surround it.

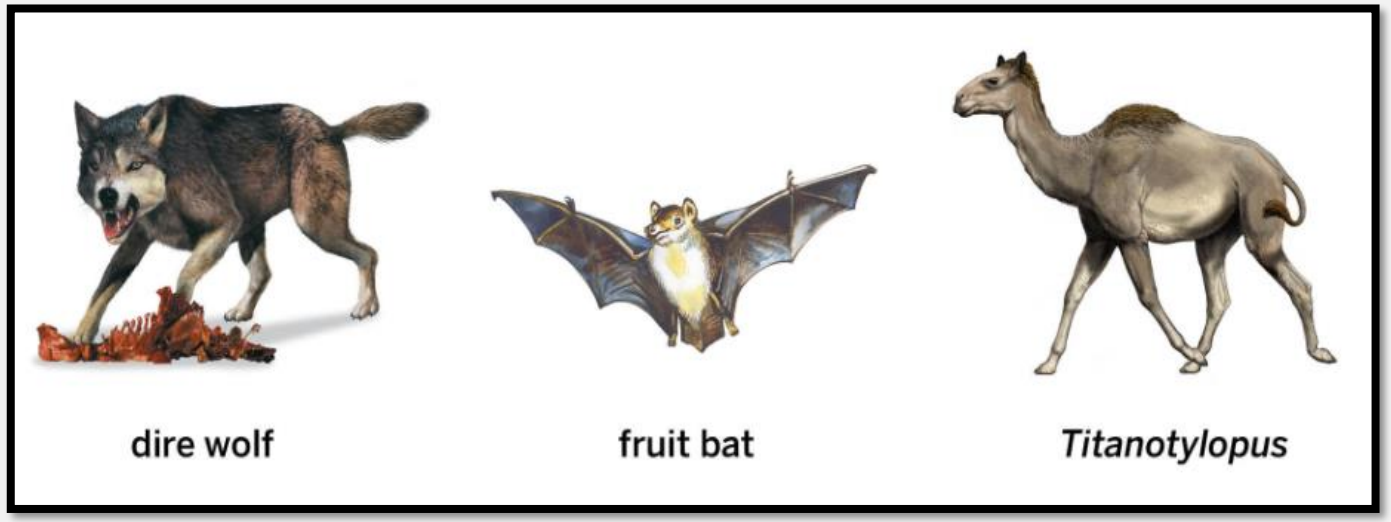
2 **HANDS ON**
Observing Organisms to Consider Differences

EH – 2.1.2: OBSERVING ORGANISMS TO CONSIDER DIFFERENCES

Observe organisms' front limb structures, then read and record information about the organisms' environments and behaviors. (25 min)

You will examine the Species Cards for each...

- the dire wolf,
- the fruit bat, and
- *Titanotylopus*.



You will first focus on making careful and precise observations of the front limbs of these three species.

The front limb of a bat is its wing and the front limbs of dire wolves and *Titanotylopus* are their front legs.

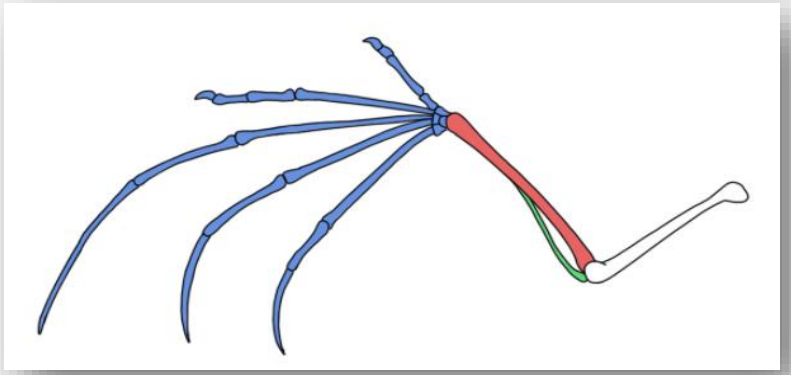
2 **HANDS ON**
Observing Organisms to Consider Differences

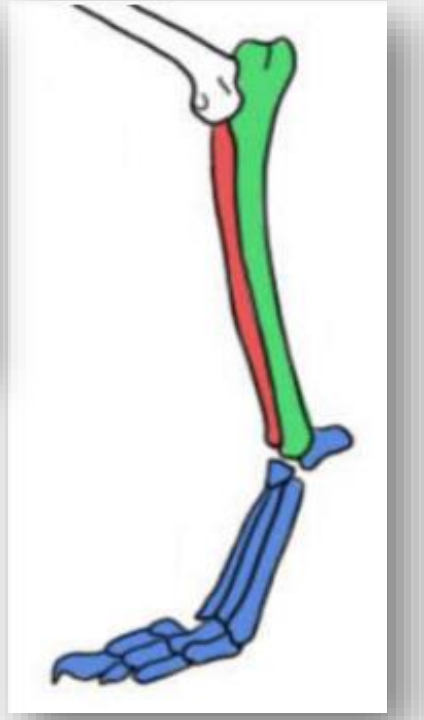
EH – 2.1.2: OBSERVING ORGANISMS TO CONSIDER DIFFERENCES

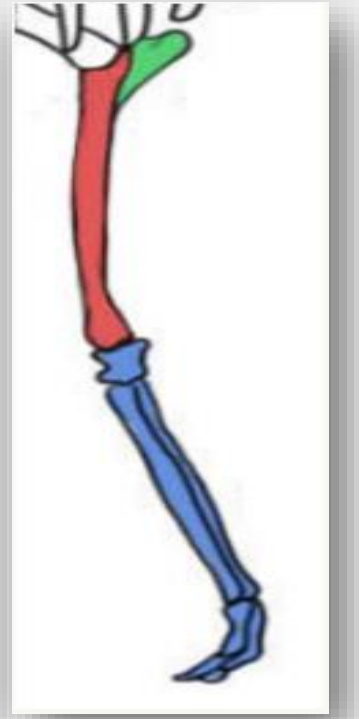
Paleontologists' Observation Guidelines

Paleontologists need to make careful observations so that they can explain their thinking and observations to others in a clear and accurate way.

Making careful observations will be especially important in this chapter, as we focus on differences.







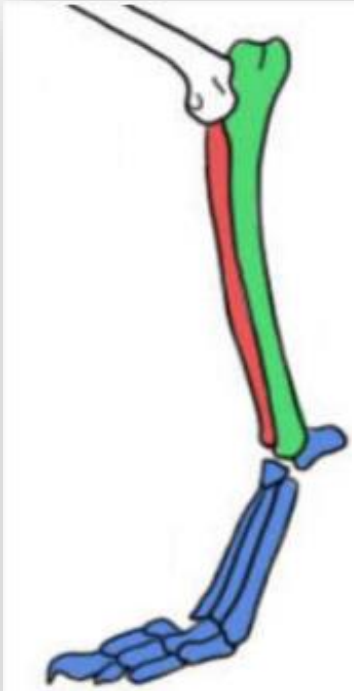
We don't want to make mistakes like those we read about in the Thomas Jefferson article.

2 **HANDS ON**
Observing Organisms to Consider Differences

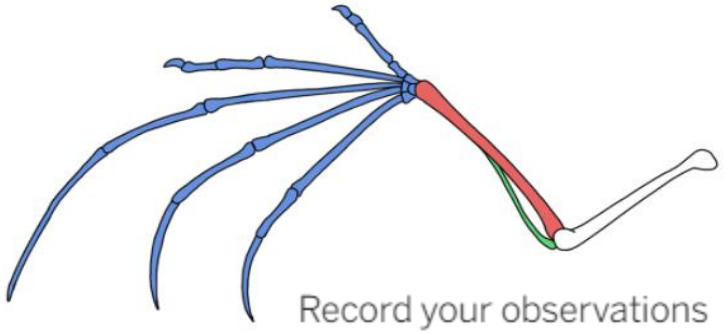
EH – 2.1.2: OBSERVING ORGANISMS TO CONSIDER DIFFERENCES

Part 1: Observing Species' Front Limbs

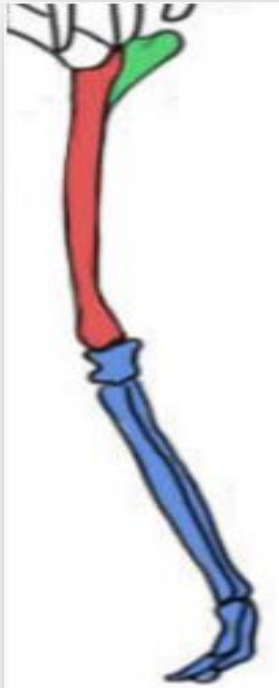
Record your careful observations of the zoomed-in illustrations of front limbs for the dire wolf, the fruit bat, and *Titanotylopus*.



Record your observations about the front limb of the dire wolf.



Record your observations about the front limb of the fruit bat.



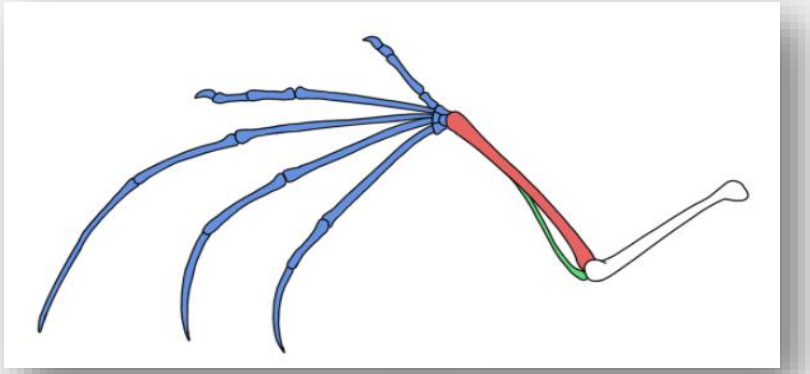
Record your observations about the front limb of *Titanotylopus*.

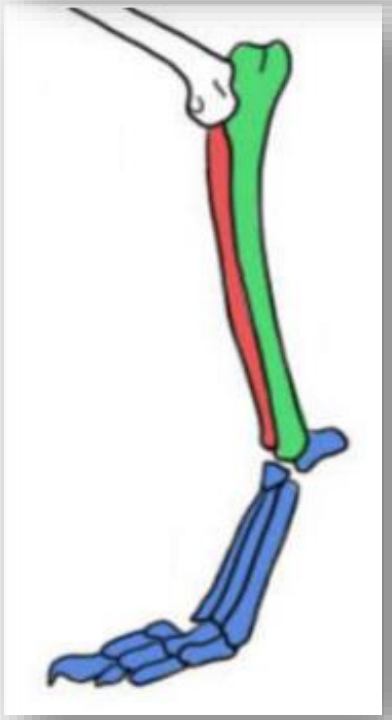
2 **HANDS ON**
Observing Organisms to Consider Differences

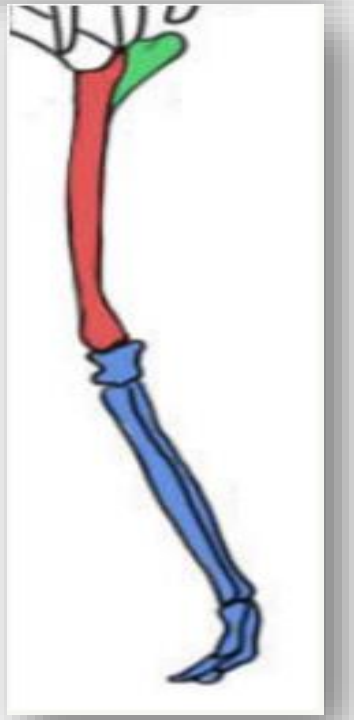
EH – 2.1.2: OBSERVING ORGANISMS TO CONSIDER DIFFERENCES

NEXT >

Let's discuss similarities and differences between front limbs.







Similarities may include the number and arrangement of bones;

differences may include…

- the absolute size of the bones (the bat is much smaller than the *Titanotylopus*, for example),
- shape and position of bones, or
- differences in the relative sizes of distal bones compared to radius and ulna bones.

These careful observations allow us to compare the limbs.

Some of your observations show similarities, but a lot of what we are seeing are differences between the shared structures.

The next part of the activity will help us to understand more about why this is the case.

2 **HANDS ON**
Observing Organisms to Consider Differences

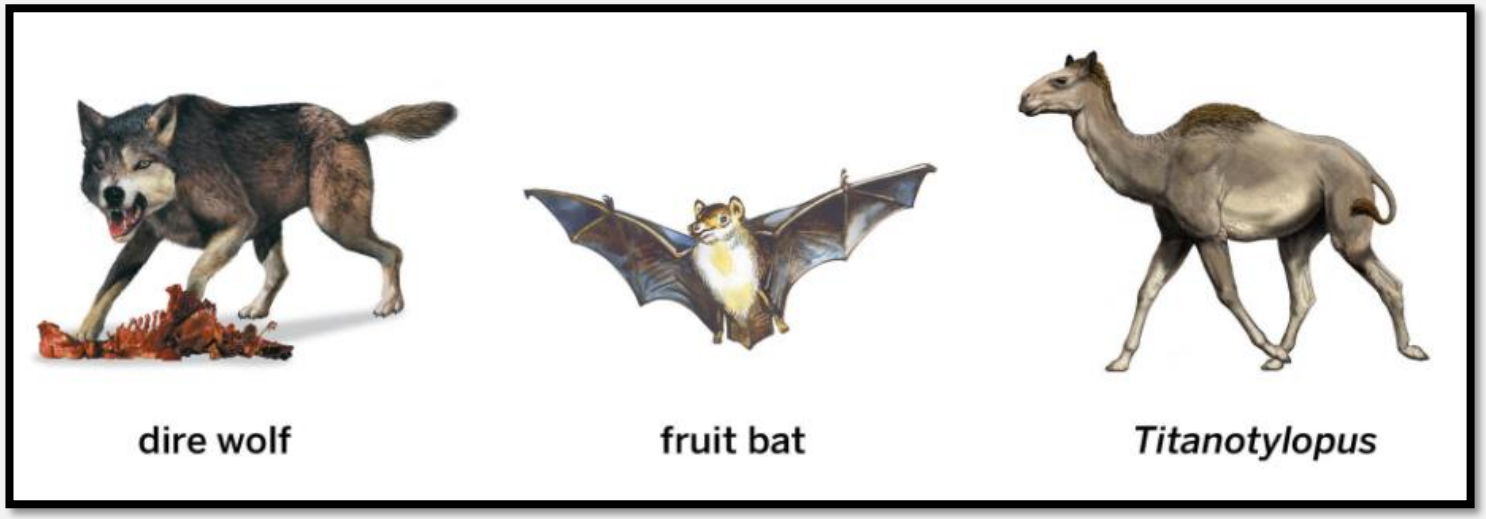
EH – 2.1.2: OBSERVING ORGANISMS TO CONSIDER DIFFERENCES

Part 2: Gathering Evidence from Species Cards

You will now get additional information about each of these species.

This information will help you to think about some of the reasons why each organism's bone structures look the way that they do.

Utilize the three Species Cards (Dire Wolf, Fruit Bat, and Titanotylopus) and read, discuss, and record information.



2 **HANDS ON**
Observing Organisms to Consider Differences

EH – 2.1.2: OBSERVING ORGANISMS TO CONSIDER DIFFERENCES

Part 2: Gathering Evidence from Species Cards

Read about each species on the cards that your teacher provided. For each species, record information about its environment and how populations survive. This might help you explain why the bones for each species are shaped the way that they are.

Dire wolves: Information about their environment and how they survived.

Fruit bats: Information about their environment and how they survive.

Titanotylopus: Information about their environment and how they survived.

3 **TEACHER LED DISCUSSION**
Discussing Differences

EH – 2.1.3: DISCUSSING DIFFERENCES

Discuss observations and generate possible explanations for the differences between the structures of the three organisms. (10 min)

Let's review all of this information you've collected and see if we can find any common thinking about how or why these organisms' front limb structures look very different.

What might explain differences in shape for the bones of the front limbs in these three animals?

dire wolf

fruit bat

Titanotylopus

3 **TEACHER LED DISCUSSION**
Discussing Differences

EH – 2.1.3: DISCUSSING DIFFERENCES

What might explain differences in shape for the bones of the front limbs in these three animals?

dire wolf

fruit bat

Titanotylopus

We observed that the dire wolf's front limb has long, sturdy bones.

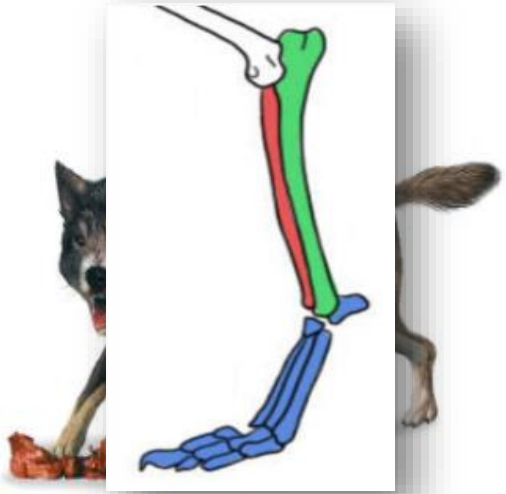
We also have information that it was a predator and needed to run and catch prey.

How do these two ideas help us to understand why these bones are shaped the way that they are?

3 TEACHER LED DISCUSSION
Discussing Differences

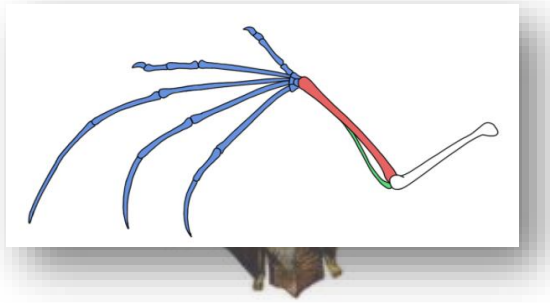
EH – 2.1.3: DISCUSSING DIFFERENCES

What might explain differences in shape for the bones of the front limbs in these three animals?



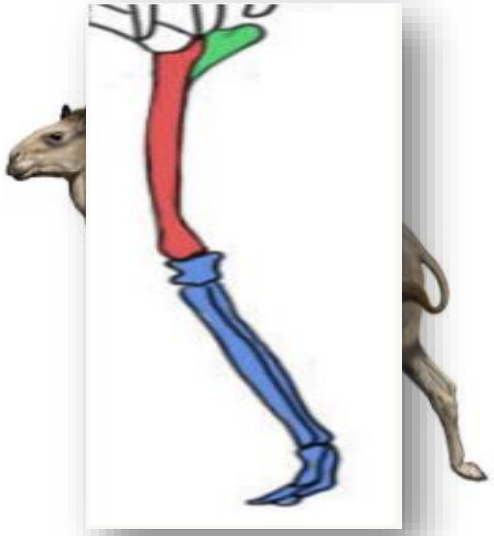
dire wolf

Long bones are good for running fast to catch prey.



fruit bat

very long, thin bones help to stretch out the fruit bat's wings and allow it to fly



Titanotylopus

long, strong legs help it to walk long distances over rough terrain like mountains and rocks.

We observed that the dire wolf's front limb has long, sturdy bones.

We also have information that it was a predator and needed to run and catch prey.

How do these two ideas help us to understand why these bones are shaped the way that they are?

3 TEACHER LED DISCUSSION
Discussing Differences

EH – 2.1.3: DISCUSSING DIFFERENCES

Summarize the discussion and connect your explanations to the concept of adaptation and to the environment where these species live.

You have recognized that the front limb bones of the organisms were useful for specific things.

- For example, the fruit bat's wing bones were useful for allowing fruit bats to fly.
- The dire wolf had the same front limb bones, but they were shaped differently and were probably useful for this organism to run, jump, and hunt, rather than to fly.

Through this activity, we have some evidence that there may be a connection between an organism's body structures, the environment in which each organism lives, and what the organism does to survive.

The different structures we see may be adaptive traits for each of these organisms in their respective environments.

3 **TEACHER LED DISCUSSION**
Discussing Differences

EH – 2.1.3: DISCUSSING DIFFERENCES

We've begun to get information to answer our Investigation Question:

How does an ancestor population evolve into descendant species with differences in their shared structures?

We will need to investigate this further to see if these ideas can help us to answer our questions about why organisms with a common ancestor can end up being so different.

Organize and Clip the Species Cards together at your table.

dire wolf

fruit bat

Titanotylopus

4 **HOMEWORK**
Homework

EH - 2.1.4 HOMEWORK

Look for differences between two species in the Sim and relate those differences to the species' different environments.

Analyzing Differences in Shared Structures

Note: If you do not have access to Amplify Science at home, your teacher will provide you with an alternate way to complete this homework.

Goal: Discover and explain differences in a shared structure.

Do:

- Open Mammals Mode of the Sim and stay in Map View.
- Find *Kutchicetus* and Saber-Toothed Cat in the Fossils Collection and open their Study Windows.
- Use the text descriptions as well as the images in the Structures Tab to answer the questions below.

4 **HOMEWORK**
Homework

EH - 2.1.4 HOMEWORK

HAND IN

Investigate all the shared structures you can find (Hint: You can look at highlighted structures 1–5 as well as unhighlighted structures). Find one shared structure that is very different between the two species.

What structure did you find?

Describe the differences in this shared structure.

Read the text for both species to learn about the environments that each of them lived in. Thinking about the environments of the two species, why do you think this bone structure was different?