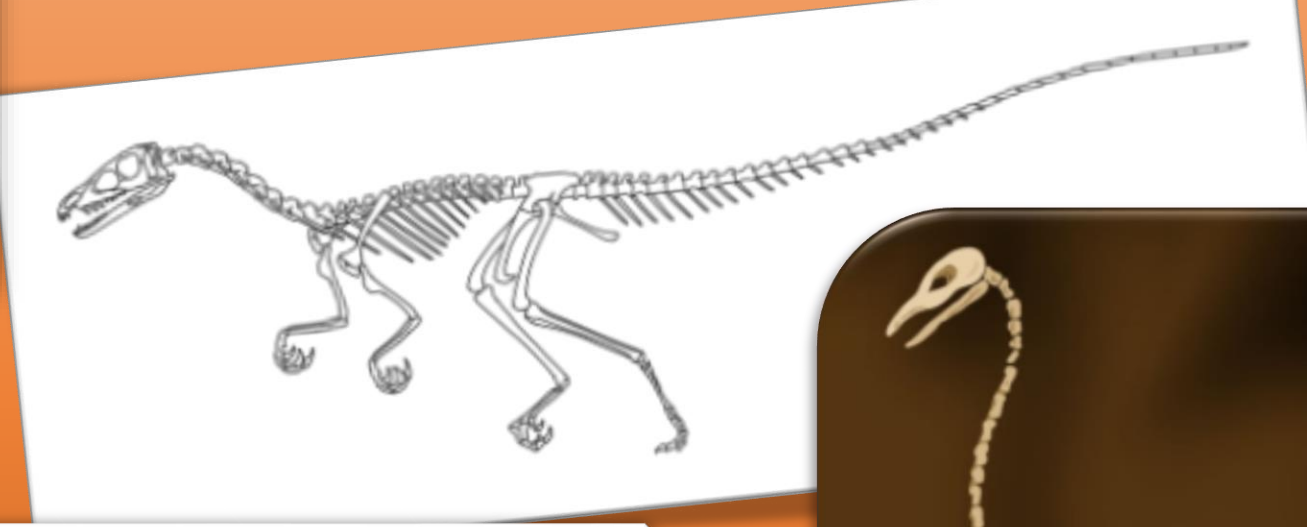
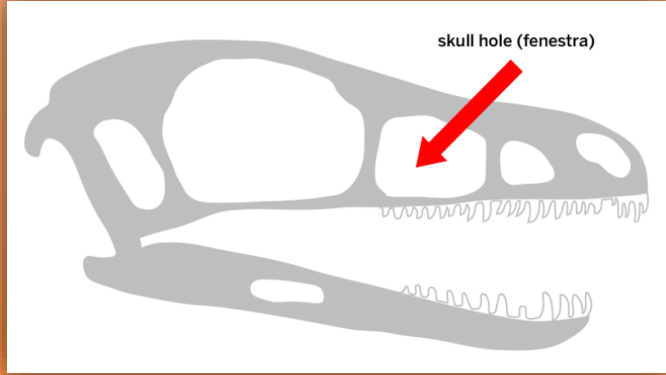


# CHAPTER 4: SCIENCE SEMINAR

1

## 4.1: Investigating the Tometti Fossil



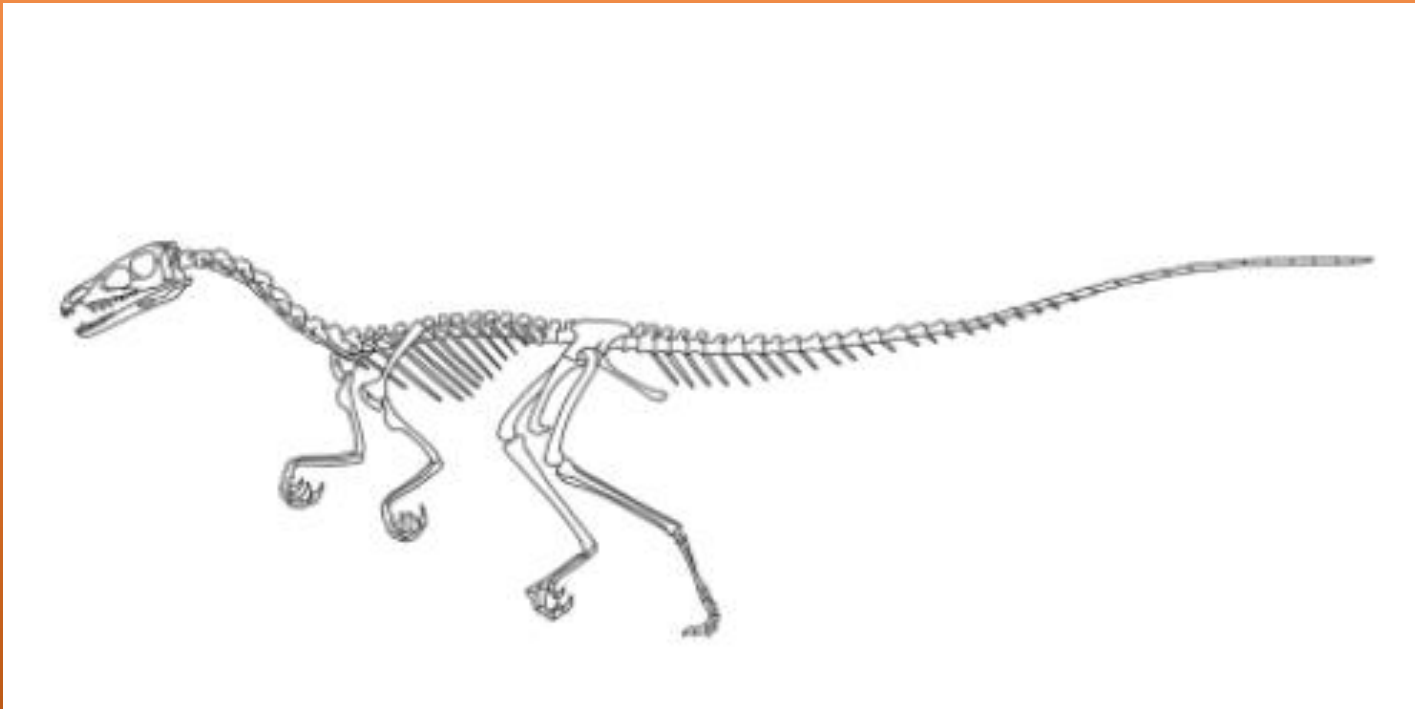


# EH: 4.1.1 WARM-UP

HAND IN

Students write down their initial ideas about an unidentified fossil. (5 min)

Examine the fossil drawing below and then answer the question to the right.



Thinking like a paleontologist, what are your first observations about this fossil?



## EH: 4.1.2 INTRODUCING THE TOMETTI FOSSIL MYSTERY

The teacher introduces the new question about the Tometti fossil, emphasizing the tools of paleontologists to determine relatedness. (15 min)

### Reading a Message from Dr. Zhang

**To:** Student Paleontologists

**From:** Dr. Zhang

**Subject:** The Tometti Fossil

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My name is Dr. Zhang, and I've heard about the excellent work you did for the Natural History Museum. Dr. Mosley suggested you might be able to help our museum in China with some similar work.

We'd like help with a puzzle we've never been able to solve about a fossil found in a nearby dig site. Dr. Michelle Tometti, a visiting paleontologist, found this fossil several years ago, brought it to our museum, and assembled it. Unfortunately, this fossil has been sitting in our storage area for the last few years. It has never been displayed on the museum floor because it was never identified. You can help us by determining which species the Tometti fossil could be most closely related to: the ostrich or the crocodile.

A few years ago, student paleontologists made a set of observations about the Tometti fossil. I want you to review these notes and determine which observations were made in a precise, careful way. We can then use the best observations as evidence for solving this mystery.





## EH: 4.1.2 INTRODUCING THE TOMETTI FOSSIL MYSTERY

The Tometti fossil was brought to a museum in China and assembled there, but it was set aside and placed in a storage room several years ago.

Dr. Tometti was called to a new dig site and was, therefore, unable to finish the work needed to identify this fossil. The museum has reached out for our help in identifying it. They look forward to pulling this fossil from the storage area where it is being held and putting it on display where it can be enjoyed by the public.

### Dig Site in China







## EH: 4.1.2 INTRODUCING THE TOMETTI FOSSIL MYSTERY

This is an image from one of the many dig sites in China. Paleontologists there have found many important fossils that are helping them complete the evolutionary tree in this country. One of their recent discoveries is the Tometti fossil, which you will be considering over the next few days.

### Dig Site in China







## EH: 4.1.2 INTRODUCING THE TOMETTI FOSSIL MYSTERY

Since the beginning of this unit, we've been considering why species, both living and extinct, share similarities and also have differences.

Applying the same skills you used to place the Mystery Fossil, you will help Dr. Zhang in China determine which of two species the Tometti fossil is more closely related to.

### Dig Site in China



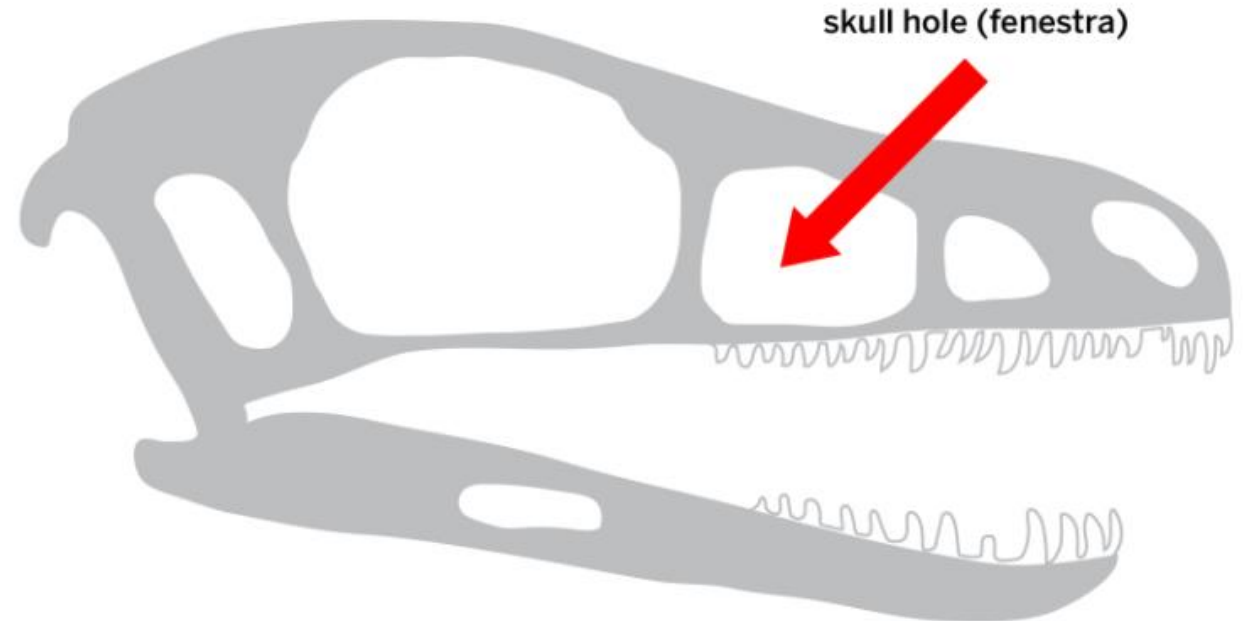


## EH: 4.1.2 INTRODUCING THE TOMETTI FOSSIL MYSTERY

As Dr. Tometti analyzed the fossil, she noticed something important:

A specific type of hole in the skull. A hole found in this location can be found in the skulls of a specific group of reptiles—all the species in this group of reptiles have this hole.

### The Tometti Skull

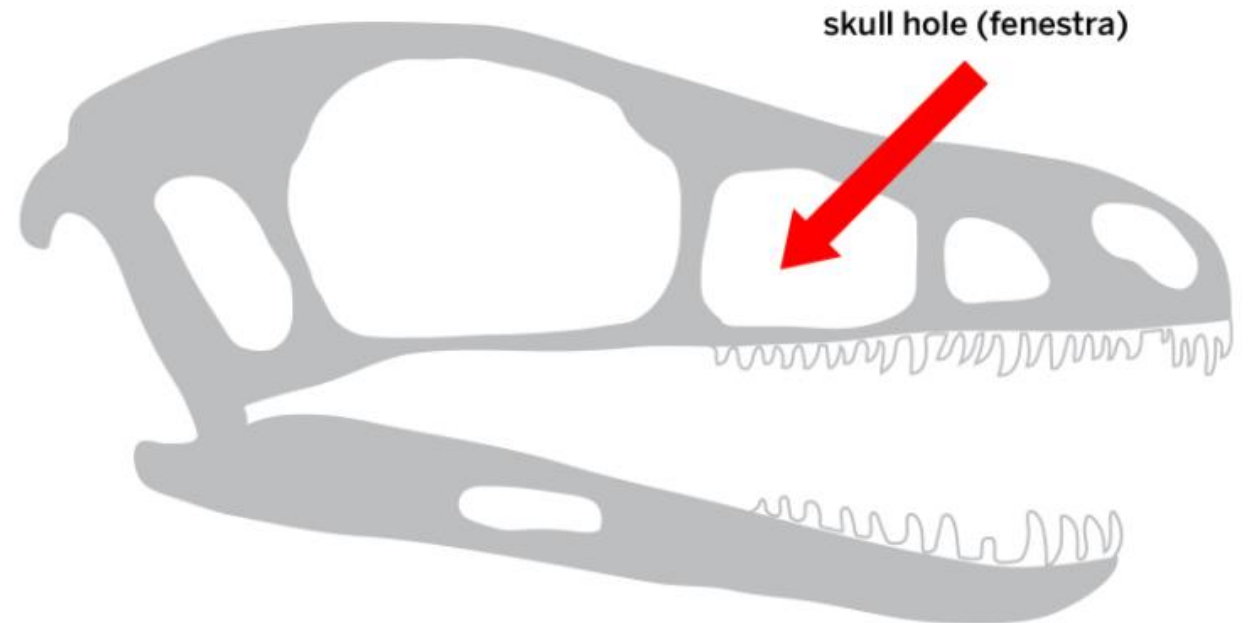




## EH: 4.1.2 INTRODUCING THE TOMETTI FOSSIL MYSTERY

Paleontologists call this hole a **fenestra**. This particular hole, in combination with other shared structures, led Dr. Tometti to conclude that her fossil shared a common ancestor with all other reptiles that have this hole.

### The Tometti Skull



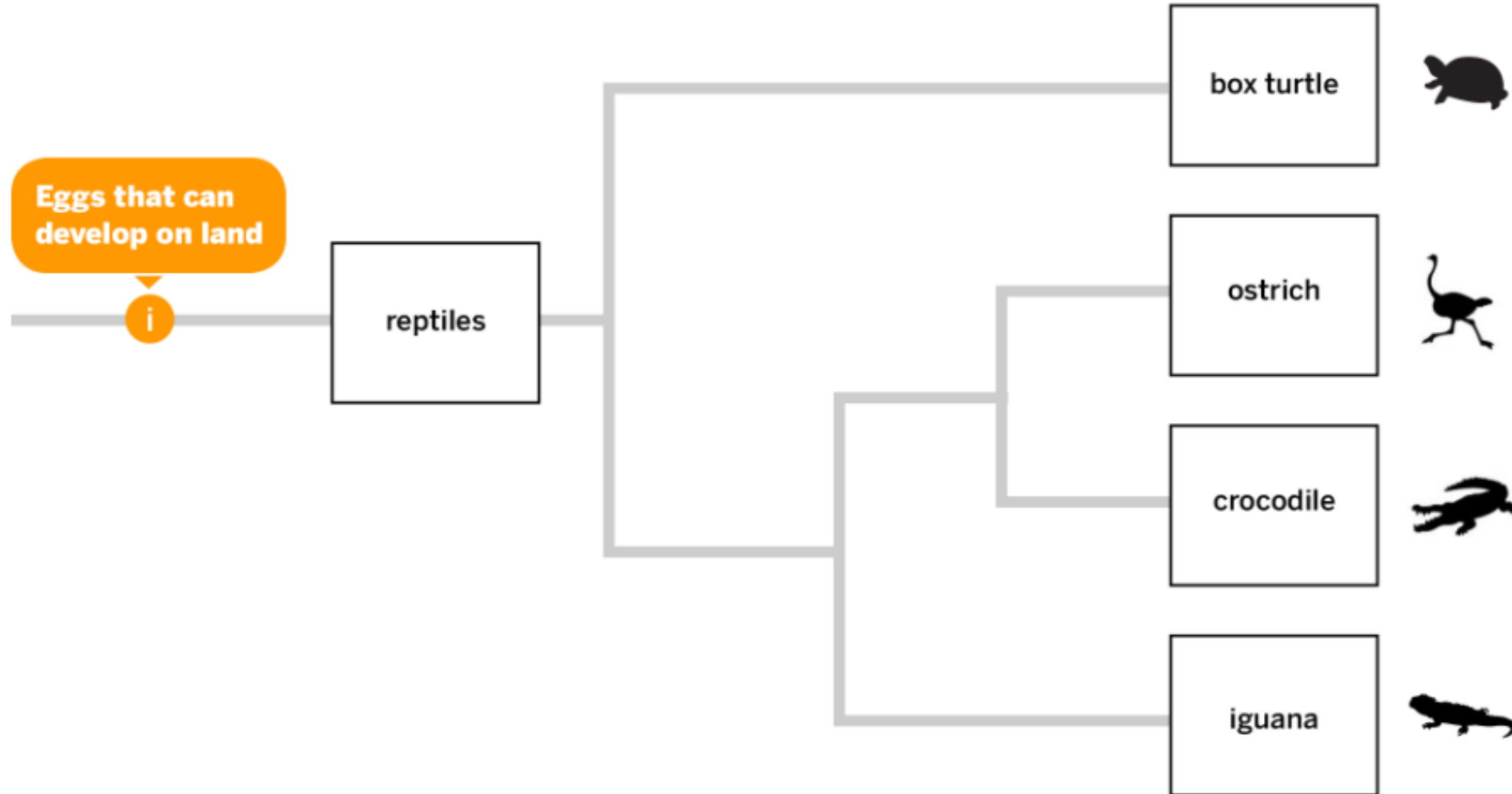






# EH: 4.1.2 INTRODUCING THE TOMETTI FOSSIL MYSTERY

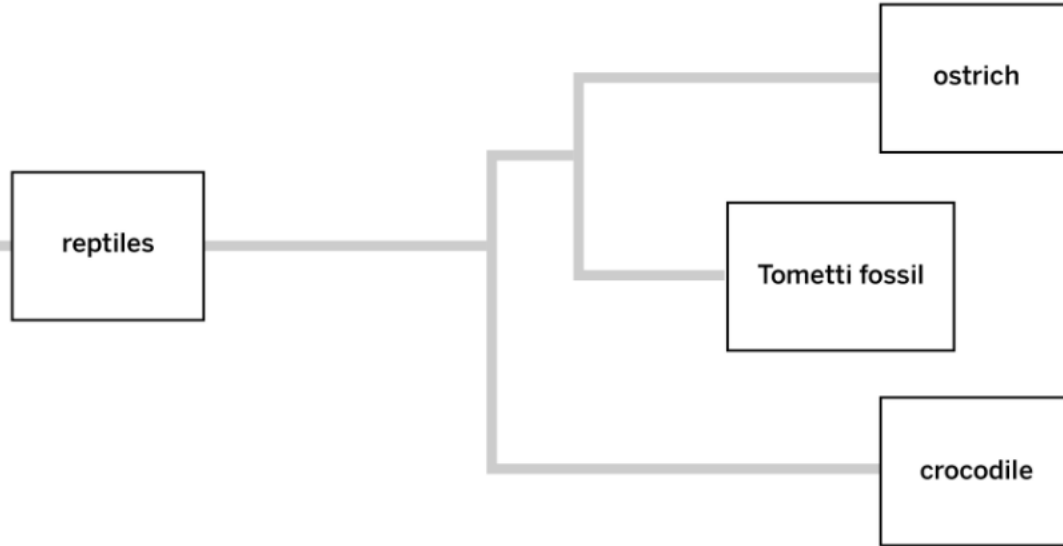
## Reptile Evolutionary Tree



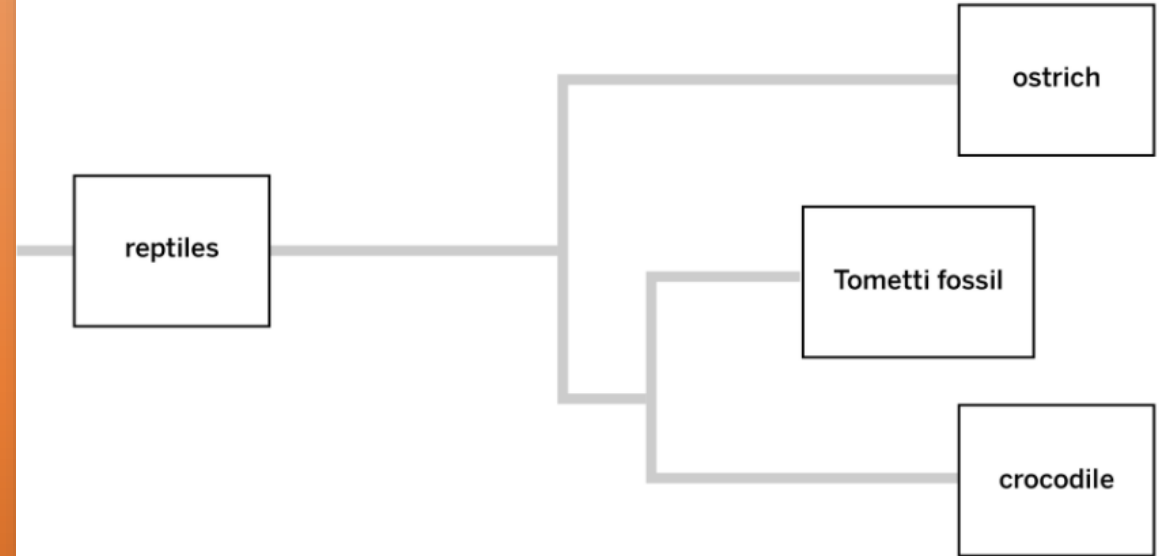


## EH: 4.1.2 INTRODUCING THE TOMETTI FOSSIL MYSTERY

**Claim 1:** The Tometti fossil is more closely related to ostriches.



**Claim 2:** The Tometti fossil is more closely related to crocodiles.



**After examining the evidence, you will decide whether the Tometti fossil is more closely related to crocodiles or to ostriches. Today, we will review evidence about the Tometti fossil.**

**Over the next few lessons, you will gather more evidence about ostriches and crocodiles. By examining this evidence, you will be able to determine which is the strongest of these two claims.**





## **EH: 4.1.3 SORTING EVIDENCE ABOUT THE TOMETTI FOSSIL**

Students determine which of the Tometti fossil observations will prove most useful. (20 min)

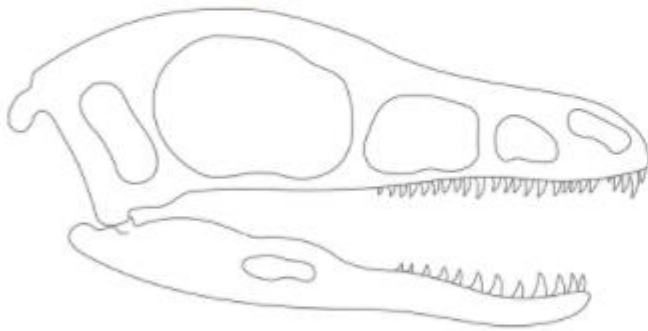
**You will examine nine evidence cards with paleontological observations made about the Tometti fossil. Students will then place these cards along the Evidence Gradient, determining which observations are stronger.**

**Many people have taken a look at the Tometti fossil since Dr. Tometti uncovered it. Most of the observations were made by student paleontologists. Some were carefully made while others were sloppy or rushed. Your job is to determine which of the observations are the most precise. Once you have determined this, we will keep these observations as evidence.**

## EH: 4.1.3 SORTING EVIDENCE ABOUT THE TOMETTI FOSSIL

### Evidence Card A: The Tometti Skull

Why are there  
so many holes?



The nostril hole is at the front of the skull. There is one huge hole on top of the skull. There are also many other holes throughout the skull. The Tometti's mouth has sharp, pointy teeth.

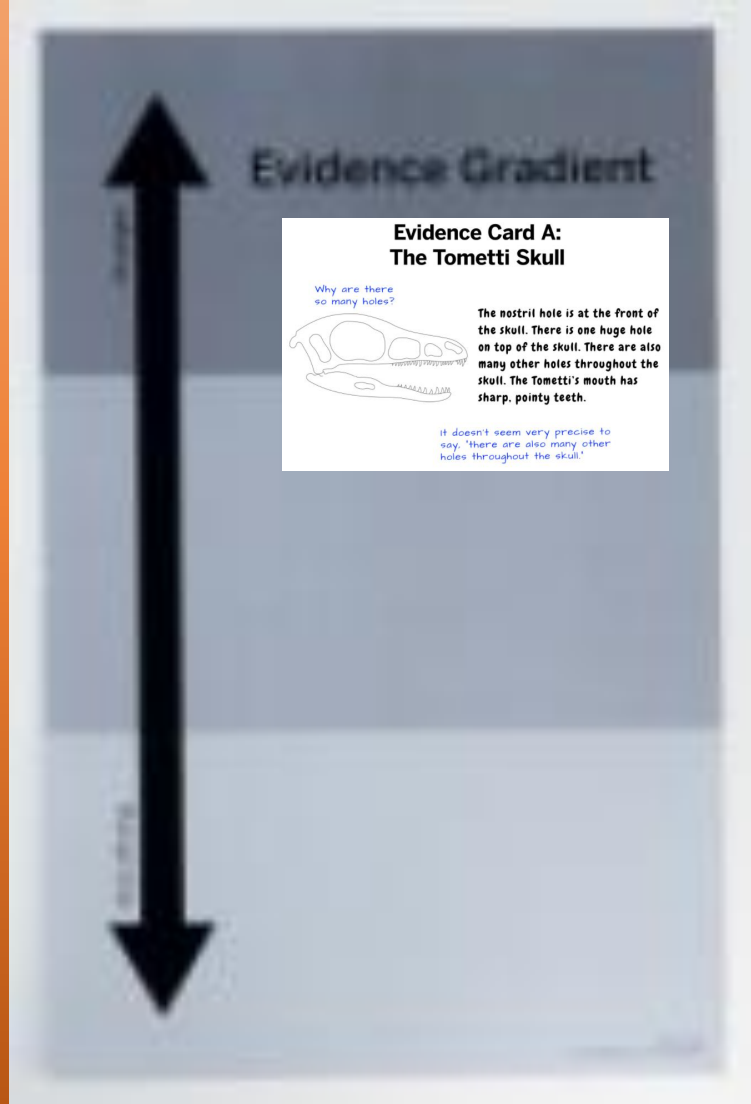
It doesn't seem very precise to say, "there are also many holes throughout the skull."

Read and annotate the cards, noting thoughts about whether each card's annotations were carefully and precisely made.

3-5 minutes to  
analyze and  
annotate cards.

## EH: 4.1.3 SORTING EVIDENCE ABOUT THE TOMETTI FOSSIL

Sorting evidence using the Evidence Gradient.



**You will consider each evidence card and discuss whether it provides an observation that is detailed and strong or one that is less strong and not as detailed.**

**Together, decide where to place each card on the gradient. Stronger observations go at the top of the gradient while less strong observations should be placed in the middle or bottom rows.**

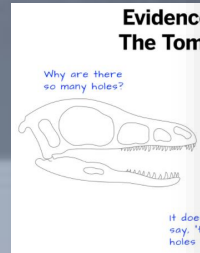
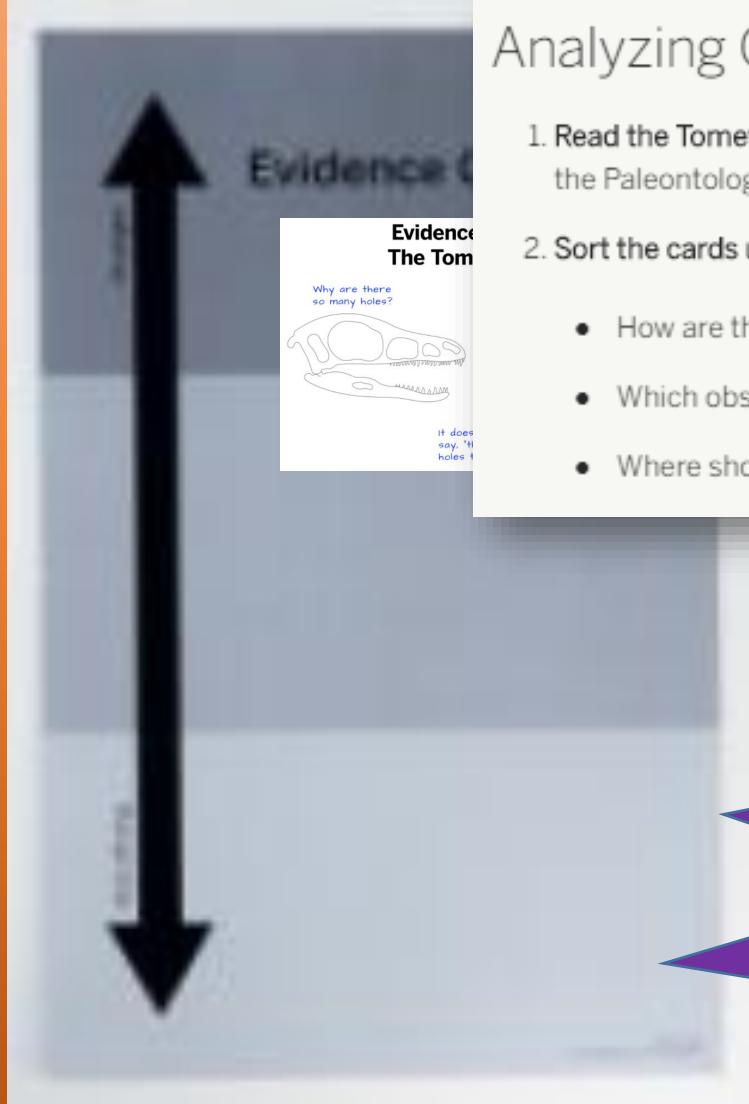
**You should listen carefully and respectfully to each other as they discuss. Pairs should come to an agreement before placing evidence cards on the Evidence Gradient. If they can't agree about a particular card, students should place that card aside.**





## EH: 4.1.3 SORTING EVIDENCE ABOUT THE TOMETTI FOSSIL

Sorting evidence using the Evidence Gradient.



### Analyzing Observations of the Tometti Fossil

1. Read the Tometti Fossil Mystery Evidence Cards. Carefully review each evidence card and discuss it with your partner. Using the Paleontologist's Observation Guidelines poster as reference, pay particular attention to the quality of the observations.
2. Sort the cards using the Evidence Gradient. As you sort the cards, discuss the following questions with your partner:
  - How are the observations on each card different?
  - Which observations would provide stronger or more convincing evidence to paleontologists? Why?
  - Where should this card be placed on the Evidence Gradient? Why?

**3–5 minutes to  
analyze and  
annotate cards.**



Students use the Evolutionary History Sim to compare crocodiles to ostriches, preparing to evaluate species in Lesson 4.2

## Differences Between Ostriches and Crocodiles

**Goal:** Use the Sim to find differences between the shared structures of the ostrich and crocodile.

**Do:**

- Open **Vertebrates mode** of the Sim, press TREE to open Tree View, and navigate to the Vertebrates section of the tree.
- Press STUDY to open Study Windows for both the ostrich and the crocodile. Then, press STRUCTURES to open the Structures tab.
- Make careful observations to answer the questions below.

List at least three structures that are shared between ostriches and crocodiles.

Choose at least two of the structures you listed above and describe any differences you notice.