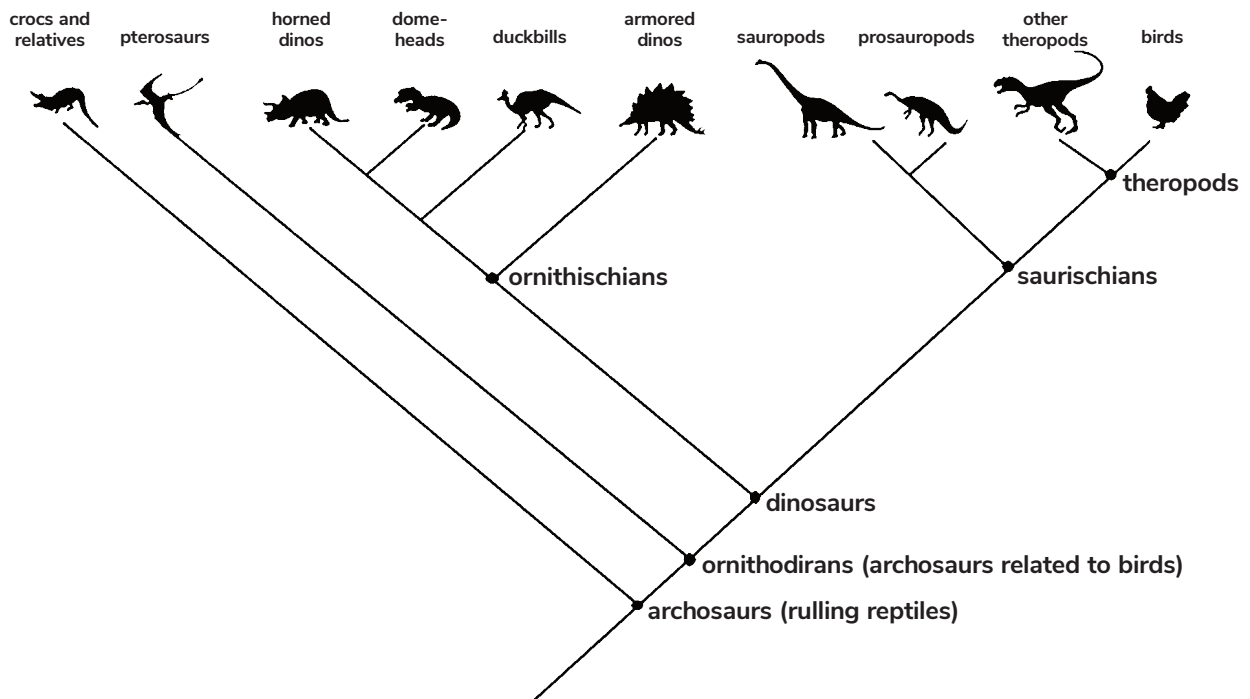


Dino-Chicken: Exploring Ancestors



Introduction: Today, you are a paleontologist, a scientist who studies the history of life on Earth through the fossil record. Your mission is to evaluate the following theory.

Theory: Chickens are the closest living relative to the *Tyrannosaurus rex*.



Station 1: Anatomy (Body Features in the Fossil Record)

Part A: Bone Structure

By looking at the fossil record, you can see that several dinosaurs, including *T. rex*, had bone structures similar to modern-day birds, such as chickens.

Dinosaur bones look like bird bones. By simply looking at the bones we have today, you can easily see that they look more like birds than any other animal. This observation was the first thing to lead researchers to believe dinosaurs were closely related to birds. For instance, look at the bones of a chicken next to the bones of a Velociraptor. They are not identical, but they are strangely similar.

For more information, see: dino-kidz.com/are-chickens-related-to-t-rex.



NOTE: The height of the *T. rex* was from 12 to 20 feet, and the average chicken is two feet tall.

Part B: Wishbones

Modern-day birds, including chickens and turkeys, have wishbones. But did you know theropods, such as the *T. rex*, also had wishbones? Take a look.



Top: A wishbone from a modern-day chicken.

Bottom: A wishbone from a family of dinosaurs which included the *T. rex*.

For more information, see kqed.org/quest/290/carving-the-holiday-dinosaur-a-phylogeny-of-wishbones.

Task: In your Venn diagram, list which body features between the dinosaur and bird skeletons are similar, and list which are different.

Photo (lower left): Jo Davisson



Station 2: Feathers

You might have noticed that each year there are more and more pictures of dinosaurs with feathers. Our traditional ideas about what Velociraptors, or even the *T. rex*, looked like are now shifting from reptile-like to bird-like.

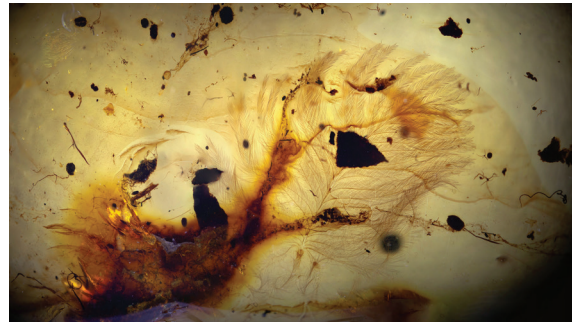
This is because paleontologists have determined dinosaurs are more like birds than any other animal. When did this discovery start? As far back as 1964, when John Ostrom discovered the *Deinonychus*. He strongly believed it was warm-blooded.

Then, in 1979, John McLaughlin suggested that many dinosaurs were feathered.

In 2011, samples of amber from the Cretaceous Era were discovered. The samples contained preserved feathers. This led paleontologists to conclude some of the feathers were used for insulation instead of flight.

Yutyrannus, described in 2012, are the largest known dinosaurs with feathers. A patch of fossilized *Yutyrannus* skin shows shaggy body feathers, similar to an emu. Related to *T. rex*, *Yutyrannus* was 30 feet long. It weighed more than 3,000 pounds.

For more information, see dino-kidz.com/are-chickens-related-to-t-rex.



Feathers preserved in amber.



Yutyrannus model.

Photo: Jo Davisson

Task: Use a magnifying glass to examine the chicken feathers at this station. How are they alike and different from the feathers shown in the image above? Sketch each type of feather on your Feather Comparison Sketch chart. Then, label the similarities and differences you see. Some paleontologists have suggested some dinosaur feathers were used for warmth, not flight. Compare the roles of dinosaur and chicken feathers. Share your comparisons with your group.

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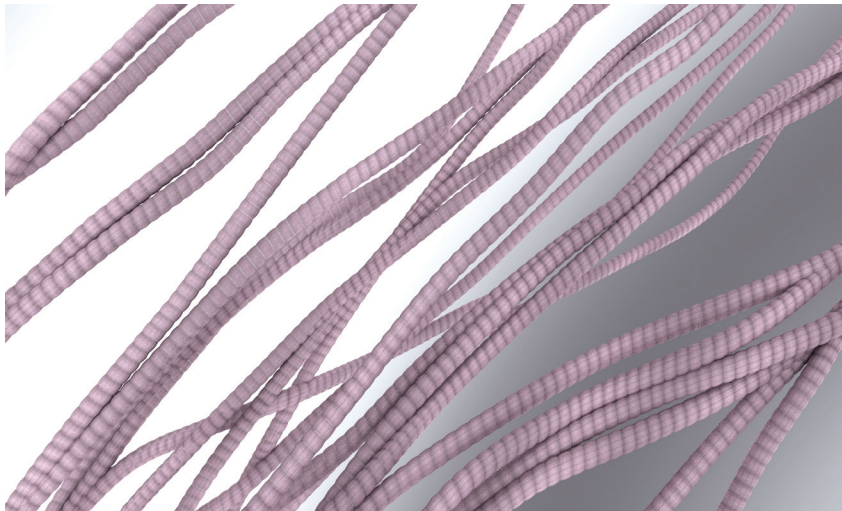
Station 3: Collagen (Protein Evidence)

In the past, scientists examined whole body parts to infer which animals of the past and present might be related. Then, scientists developed DNA and body tissue analysis. Now, they can compare the body tissues of organisms, too.

However, gathering DNA or body tissue from fossils seemed impossible. Both DNA and body tissue quickly break down when an organism dies. Then, scientists made a groundbreaking discovery.

To obtain molecular evidence about dinosaurs, you need some actual molecules. This is a tall order for a group of animals that died out 65 million years ago. But, in 2003, scientists Jack Horner and Mary Schweitzer discovered some material that was not fossilized inside a *T. rex* bone. This was a result of a combination of luck, desperation, and sharp eyes.

Faced with flying a giant femur (leg bone) out of a remote Montana field site, scientists broke the bone in half so it would fit inside their helicopter. When they broke this bone, they discovered the tissue inside. If their helicopter were larger, they may have not made the discovery!



The word “collagen” comes from the Greek word, *kolla*, which means glue.

Collagen is like a glue holding your skin and muscles together.

Unlike in *Jurassic Park*, real-life researchers could not recover any DNA from the ancient remains. But they did retrieve molecules of collagen, which is a structural protein. Collagen appears in slightly different forms in many animals. Researchers compared the *T. rex* collagen with the collagen of 21 living animals. These animals included humans, chimps, mice, chickens, ostriches, alligators, and salmon. *T. rex*’s collagen proved to be the most similar to that of chickens and ostriches. Its next closest match was to alligators.

Chickens and ostriches are only distantly related to each other. So, the research says little about which kind of birds might be most closely related to the famous carnivore. The scientists noted that finding out would require data from different molecules, not just collagen molecules.

For more information, see

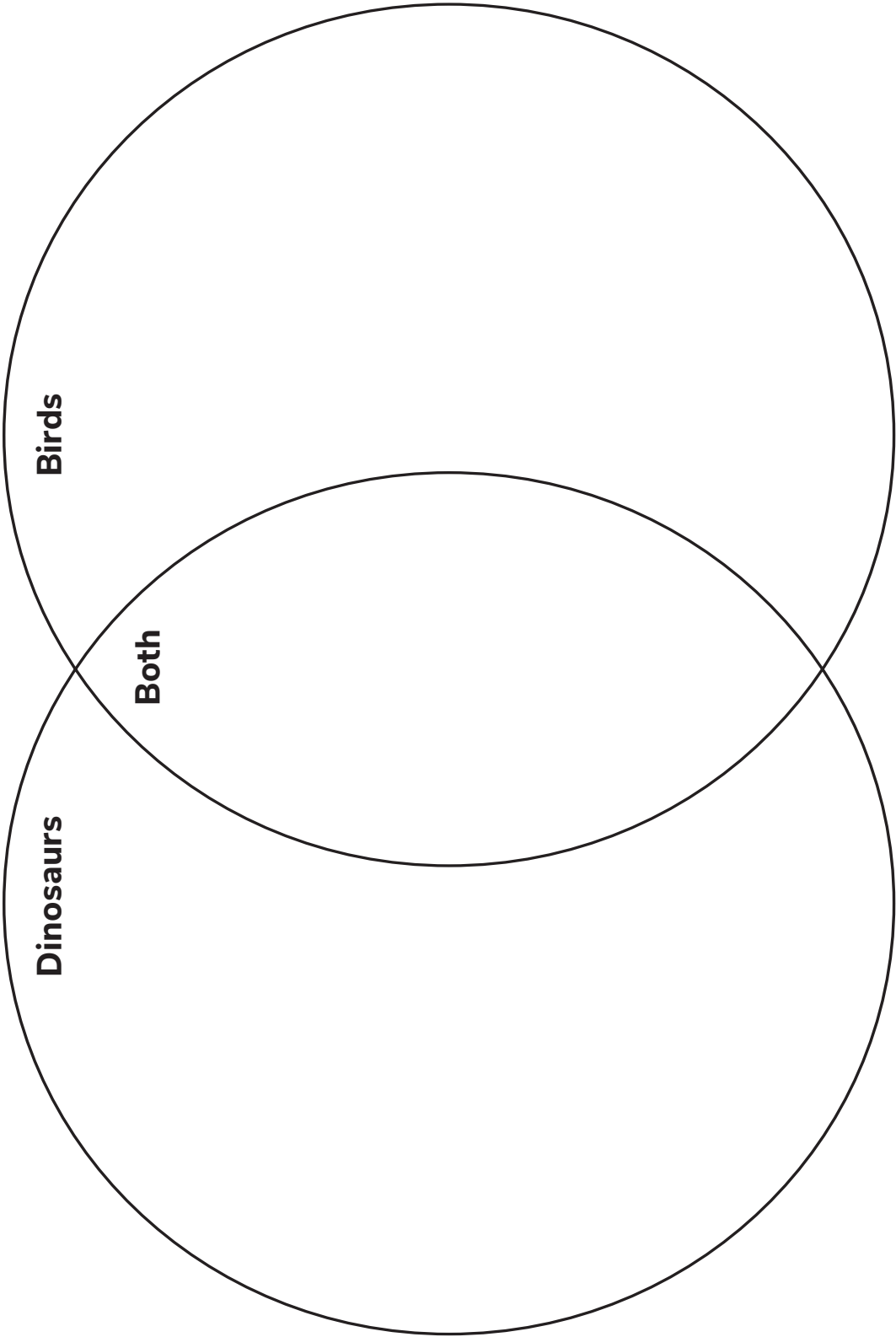
smithsonianmag.com/science-nature/t-rex-linked-to-chickens-ostriches-180940877.

Task: Discuss the following: Why was finding collagen inside a dinosaur bone such a major discovery? What did the collagen evidence show? Are chickens very closely related to *T. rex*, or is more information needed to make further conclusions? Explain your answer with evidence.



Stations Answers

Station 1: Anatomy



Stations Answers (continued)

Station 2: Feather Comparison Sketch

Dinosaur Feather	Chicken Feather

Station 3: Collagen (Protein Evidence)

Discuss: Why was finding collagen inside a dinosaur bone such a major discovery? What did the collagen evidence show? Are chickens very closely related to the *T. rex*, or is more information needed to make further conclusions? Explain your answer with evidence.

