## Dinosaurs in the sky

**Q. How might Struthiomimus have used its feathers?**

A. Probably not to fly, right? Maybe they used them like ostriches do: to attract females, frighten other males, and help them keep their balance while they ran. "Struthiomimus" means "ostrich mimic"!

**Q. How might Velociraptor have used its feathers?**

A. Velociraptor had feathers too! Holes have been found all along their arm bones where feather quills go on modern birds. Fossils of other dinosaurs very similar to Velociraptor have also been preserved with the remains and impressions of actual feathers.

Velociraptor was not built to fly, but may have used its feathers to help keep its balance while tackling prey, the way eagles and other predatory birds (raptors) do today.

# Thank you for visiting!

CSTL Center for Science Teaching & Learning

**Learn more about our other programs at**

**www.cstl.org**
**(516) 764-0045**

**1450 Tanglewood Road,**
**Rockville Centre, NY, 11570**

CSTL Center for Science Teaching & Learning

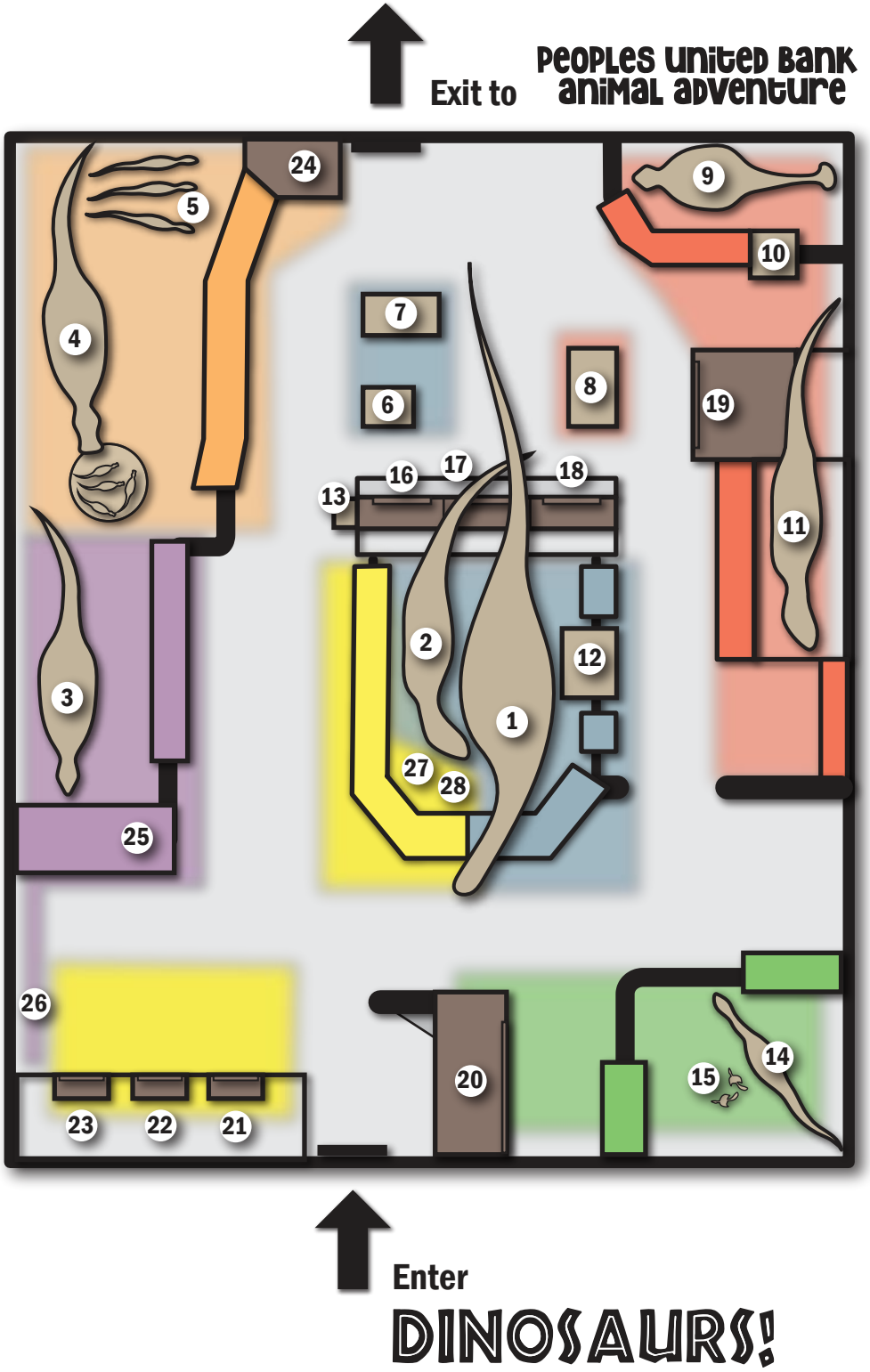
# DINOSAURS!

**and**

# PEOPLES UNITED BANK ANIMAL ADVENTURE

# Exhibit Guide

**FOR PARENTS AND TEACHERS**




## Predator and prey - the struggle

**Do you think ankylosaurs used their bony shells for protection?**

Probably. Ankylosaur shells were thick, sturdy, and covered the entire top half of their body.

**Do you think Stegosaurus used its plates for protection?**

Probably not, right? The plates hardly cover any part of their body so don't offer much protection. They are also tall and flimsy. Instead they may have used their plates for display, like peacock feathers, to attract mates.

**Why would a prey animal need to see in many directions at once?**

Because lots of animals are trying to eat them and predators can come from any direction.

**Q. Why might it be less important for a prey animal to see how far away something is?**

A. The prey animal will keep running until it stops being chased, whether the predator is close or far. Also, prey animals usually eat plants, and plants do not move; a rabbit does not need to chase after its grass.

**Q. Why would a predator need to see especially well in the forward direction? Why would a predator need to know how far away something in front is?**

A. Predators chase prey. They need to see well in the forward direction because they run forward, not sideways or backwards. They need to know how far away the prey is so they know how fast to run and when to pounce.

**Rank these two-legged runners. Which do you think was fastest? Which do you think was slowest?**

Hands-on Activity

Answer key to hands-on activity:




Fastest ⟷ Slowest

**Q. Based on its speed ranking, do you think Deinonychus chased its prey, or do you think it used a hide-and-surprise strategy (also known as an ambush)?**

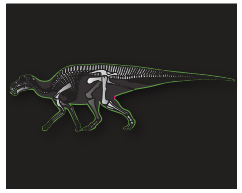
A. Deinonychus may have been more of an ambush predator than a chase predator, based on its speed ranking (somewhere between an emu and a duck, based on relative leg length).

**Q. Rank these four-legged runners. Which do you think was fastest? Which do you think was slowest?**

Hands-on Activity

Answer key to hands-on activity:



CATCHING ITS PREY | RUNNING FROM FASTER PREDATORS | RUNNING FROM SLOWER PREDATORS | RUNNING FROM SLOWER PREDATORS

Fastest ⟷ Slowest

This exhibit is all about adaptations - the features that help living things survive in their environments.

What adaptations helped dinosaurs survive for 150 million years? What adaptations help their descendants (the birds) and other living things survive today? This exhibit explores these questions.

**DINOSAURS!** is divided into six thematic sections, color-keyed on the map to the left and corresponding to the topics below:

## What is a dinosaur?
Adaptations for an active lifestyle

## Big and small
Body size - is smaller better? is bigger better?

## Food, form, and function
Adaptations for eating the food that powers the body

## Living things in motion
How dinosaurs and other animals adapt through movement

## Predator and prey - the struggle
Adaptations for attack and defense

## Dinosaurs in the sky
Feathers, flight, and a new world of possibilities

# A key to the museum attractions (refer to map):

1. Camarasaurus (fossil casts, articulated)
2. Allosaurus (fossil casts, articulated)
3. Stegosaurus (animatronic - SFX on a motion sensor)
4. Maiasaura with babies (fossil casts, articulated)
5. Deinonychus (fossil casts, articulated - three)
6. Diplodocus skull (fossil cast)
7. Gryposaurus skull (fossil cast)
8. Centrosaurus skull (fossil cast)
9. Ankylosaur (animatronic - SFX on a motion sensor)
10. Ankylosaurus tail club (fossil cast)
11. Albertosaurus (fossil casts, articulated)
12. Tyrannosaurus rex skull (fossil cast)
13. Hadrosaur eggs (real fossils)
14. Struthiomimus (fleshed-out model - no SFX)
15. Archaeopteryx (fleshed-out models - no SFX)
16. Box turtle (live animal)
17. Bearded dragon (live animal)

## Living things in motion

Hands-on Activity

**Q. Which body type looks the most like Maiasaura?**

Answer key for hands-on activity
(visitors use weights to tip dinosaur shapes onto two legs)

Maiasaura looks most like one of these two (see arrows):

**Q. Do you think it would be easy or hard (or somewhere in between) for Maiasaura to stand on two legs? Do you think Maiasaura walked on two legs all the time, some of the time, or never?**

A. Based on the balancing activity above, probably somewhere in between. If the difficulty of standing on two legs is somewhere in between, Maiasaura probably stood on two legs only some of the time.

**Q. Did Maiasaura moms care for their babies in the nest until they got big, like birds today?**

A. Yes! If the Maiasaura babies had spent a lot of time in the nest (as opposed to being buried and fossilized right after they hatched), the eggs should be trampled, the babies' teeth should be worn from eating what mom brought, and the babies should be together in the nest. When paleontologists study fossil Maiasaura nests, they see all these things!

**Q. How might Maiasaura have benefited from being able to walk on two legs and all four?**

A. When standing on two legs, they could reach for food in higher places, allowing them to gather more for their hungry babies. When standing on four legs, they could gather food from the ground.

**Q. What kind of food would T. rex have eaten with these teeth?**

Hands-on Activity

A. Bone. The teeth lack a sharp edge, so probably were not used as knives. T. rex probably ate big chunks of meat, then used its hammer-like teeth to break bones and eat the nutritious marrow.

**Q. What kinds of foods were these dinosaurs eating?**

Hands-on Activity

Museum activity answer key:

**Q. How can we tell if T. rex's bite was strong if we've never seen a T. rex?**

**Q. Should T. rex bite marks found in the fossils of other dinosaurs be shallow or deep?**

A. Deep. Many fossils have deep bites from T. rex teeth.

**Q. How strong would a bite have to be to crack open a large bone? Can you think of an experiment that could test this?**

A. Paleontologists press casts of teeth into bone, using machines to measure the amount of force it takes to make bite marks as deep as the ones found in fossils. Cracking a Triceratops hip takes enormous force.

18 Uromastyx (live animals - two)

19 Baby alligators (live animals - two)

20 Sun conures (live animals - three)

21 Stick insects (live animals)

22 Green tree frogs (live animals - three)

23 Reeve's turtle (live animal)

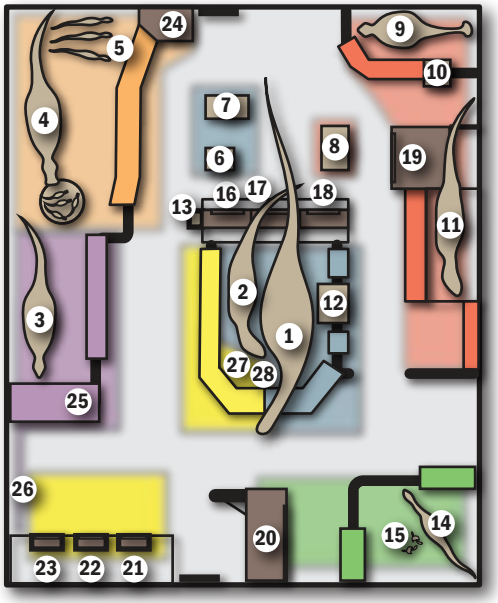
24 Ball python (live animal)

25 Coelophysis (fossil cast)

26 Struthiomimus (fossil cast - legs and arms)

27 Compsognathus (fleshed-out model)

28 Hypsilophodon (fleshed-out model)



Each thematic section of the exhibit contains questions that invite visitors to apply critical thinking to a topic related to that theme.

What follows is a key to the questions, color-keyed according to thematic section, along with potential answers.

## What is a dinosaur?

Hands-on Activity

**Q. Where would the leg bones hit each hip when the animal walked, on top or on the side?**

A. Lizard: along the side. Coelophysis: along the top.

**Q. Where should each hip be strongest, on top or on the side?**

A. Lizard: along the side. Coelophysis: along the top.

**Q. Why do you think the femur (upper leg bone) of Coelophysis is L-shaped, instead of straight like the lizard's?**

A. So the short end of the L-shaped femur can insert into the hip, and the long end can point downward to support an upright stance.

Hands-on Activity

**Q. What made this hole in Allosaurus's tail bone?**

A. Stegosaurus! The tail spike fits perfectly through the hole.

Compared to many living reptiles, dinosaurs were highly active. Fighting between predator and prey was frequent and sometimes intense.

## Big and small

**Q. Can you think of one trait all these animals share?**

A. They are all small.

**Q. How do you think these animals' size might help them survive?** A. They can hide much more easily.

Hands-on Activity

**Q. What features on the neck bones may have helped lighten the load for a long-necked dinosaur?**

A. The chambers. The vertebra is mostly air in the middle, but still has a ring of bone for large muscles to attach.

Hands-on Activity

**Q. How might having a long neck help a big dinosaur save energy?**

A. A longer neck means you can reach more plants without having to move your enormous body.

**Q. Why stay little in a world of giants?**

A. Little animals can hide; they can also fill their stomachs faster (one disadvantage: their stomachs empty faster, too).

## Food, form, and function

Hands-on Activity

**Q. What kind of food would Allosaurus have eaten with these teeth?**

A. Meat. The teeth are thin and sharp, with large serrations. They cut like steak knives.

Hands-on Activity

**Q. What kind of food would Camarasaurus have eaten with these teeth?**

A. Branches, twigs, and pine needles that were then swallowed whole. The teeth are broad and strong but still sharp, coming together like garden shears. Because the biggest teeth were in front, Camarasaurus could fit whole branches into its mouth and cut them at the base.