

PBIS



ANIMALS IN ACTION

As a student scientist, you will...

**Ask
QUESTIONS**

**APPLY
MEANING**

Pursue
ANSWERS

**Make
MEANING**

Share
ANSWERS

What's the Big Question?

How do scientists answer big questions and solve big problems?



Imagine that on your way to school one morning you see a bird. It swoops down to the ground then flies back into the tree. You stop to watch and wonder what the bird is doing. Why is it going back and forth between the ground and the tree? You see a small pile of crumbs on the ground. Then, you notice a nest built in the tree branches. All these things help you realize that the bird is feeding its young in the nest. When you take the time to watch the world in this way, you are acting much like **biologists** do.

biologist: a scientist who studies living things.

observe: to use one of the five senses to gather information about an object or phenomenon.

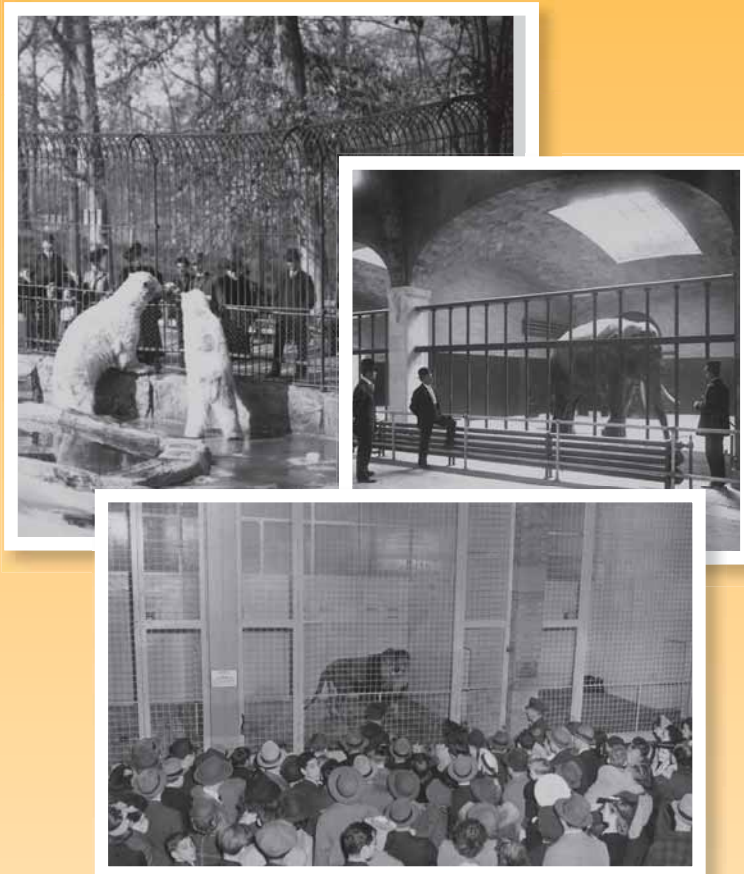
Biologists are a group of scientists who study living things. One thing they study is the behavior of animals. Studying animal behavior helps them better understand the living world. The results of their studies can help you to see animals in a new and different way. Through the study of animals, you may even better understand your own behavior or the behavior of your friends.

In this Unit, you will **observe** and study the behavior of several animals. You will learn about how animals feed and communicate with each other and what conditions affect those things. You will also develop some tools to help you collect and organize your observations. These tools will help you analyze your data as you try to answer the *Big Question: How do scientists answer big questions and solve big problems?* You will answer this question in the context of a science question: *Why do animals behave the way they do?*

*Welcome to Animals In Action!
Enjoy being a student scientist.*

Think about the Big Question

In this Unit, you will respond to a challenge to answer the *Big Question*. Before you start to think about what you already know about the *Big Question*, read about the challenge you will address.



Your Challenge

Look at the pictures on this page. They show animal **enclosures** found in zoos early in the 20th century. Some of these zoos were built over 100 years ago. Observe the pictures closely. The animals in these enclosures are all in cages. The zoos kept very large animals and smaller mammals, birds, and reptiles in similar enclosures. Zoos built these kinds of enclosures for animals at a time when zoos were designed for the display of animals and as places where people could have fun. In addition to animals, the zoo might also have had an amusement park, a playground, or a dance hall. The animal cages were usually very primitive. They were made of steel with cement floors and only sometimes included trees or water.

Zoos do not have amusement-park rides anymore. Today, zoos are concerned with **conservation** and education rather than the display of unusual animals. As the purposes of zoos have changed, so have spaces built for the animals. Nowadays, many zoos build animal spaces in ways that allow the animals to live more like they do in their natural habitat and allow people to learn about animals by watching them. For example, in the 1920s, the Detroit Zoo built a new home for birds. The large domed building held many cages for the birds to live in. The building was a bright and comfortable place for zoo visitors to watch the birds.

In 1996, the Detroit Zoo renovated the old bird house transforming it into a new butterfly house and interpretive center. Now birds, as well as butterflies, are free



The Detroit Zoo's Bird exhibit, built in the 1920s.



Toucan at the Central Park Zoo in New York City.



This panda's exhibit at the National Zoo, in Washington, DC, is based on the needs of the panda.

to fly within the building. There are many plants for shelter and water in the renovated exhibit. The space created for the animals has changed, and so has what people can learn by watching the animals.

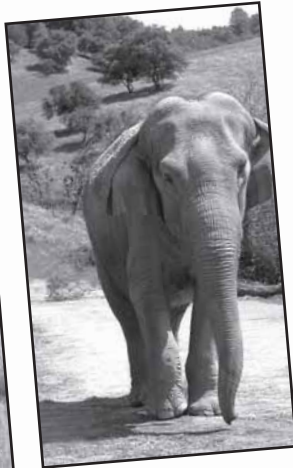
One goal of zoos is to make the zoo **habitat** as close to the animal's natural environment as possible. When animals live in areas that look more like their natural surroundings, they are more likely to act naturally. This way, biologists can find out more about animal behavior, and zoo visitors can better see how animals behave in their natural habitats.

Recently, the panda enclosure at the National Zoo in Washington, DC was updated. The National Zoo is committed to making the captive animals' lives as similar to their natural life as possible. The design of the new panda area was based on scientists' observations of pandas in the field. To determine what important features the new environment would need, scientists watched as the pandas ate, played, slept, and interacted with one another. The pandas are thriving in the new habitat, and zoo visitors and scientists are learning more about these animals.

enclosure: an area that is surrounded by something like a fence or a wall.

conservation: the preservation, management, and care of natural and cultural resources.

habitat: a place where animals (including people) live.



WHAT'S NEW IN ZOOS

All zoos are putting the needs of the animals first. In 2004, Michigan's Detroit Zoo was one of the first zoos to permanently close its elephant exhibit and retire two female Asian elephants, Winky and Wanda, to a sanctuary. The Detroit Zoo chose to do this for ethical reasons. Detroit Zoo Director Ron Kagan stated, "Now we understand how much more is needed to be able to meet all the physical and psychological needs of elephants in captivity, especially in a cold climate."

Winky, now age 51, and Wanda, now age 46, were captured in the wild as babies and have been companions at the Detroit Zoo since 1994. Thanks to the Detroit Zoo's humane decision, Winky and Wanda will enjoy full, enriching years of retirement, roaming through hundreds of acres of natural habitat in the company of many other elephants.

Your challenge for this Unit is to design a new enclosure that will accommodate the feeding or communication of one of the animals you study in this Unit. Your goal will be to design the zoo environment so it is similar enough to the natural environment of the animal to allow the animal to feed or communicate effectively. The enclosure will also have to allow visitors and scientists to observe the animals clearly.

Identify Criteria and Constraints

Before getting started on a challenge, it is important to make sure you understand the challenge. Design challenges have two parts: **criteria** and **constraints**.

Criteria are goals that must be satisfied to achieve the challenge. For the zoo enclosure challenge, this will include designing the enclosure so that the animals it will hold can communicate or feed as they would in their natural habitat. It will have to allow scientists and zoo visitors to observe the animals effectively.

Constraints are factors that limit how you can address a challenge. Your biggest constraint will be that the enclosure be built close to where you live. You will be able to assume that space can be found, but you will have to think about the weather where you live and how it will affect your enclosure design. You can probably think of other constraints.

With your class, identify the full set of criteria and constraints for this challenge, and put them on a chart like the one below so that you will remember them as you move through the Unit.

criteria:
(singular,
criterion)
goals that must
be satisfied to
successfully
achieve a
challenge.

constraints:
factors that
limit how you
can achieve a
challenge.

The Zoo Enclosure Challenge	
Criteria	Constraints
The animal you choose has to be able to feed or communicate as it would in its natural habitat.	The weather where we live will require...
It has to be easy for zoo visitors to observe the feeding or communication.	

Create a Project Board

Project Board: a chart for keeping track of progress as you work on a project over a long period of time.

In this Unit, you will be working toward achieving a *Big Challenge*. This Unit, like other Units in *Project-Based Inquiry Science (PBIS)*, is broken into *Learning Sets*. Each *Learning Set* helps you learn a different set of concepts and skills. At the end of each *Learning Set*, you will work toward applying what you have just learned to the *Big Challenge*. Then at the end of the whole Unit, you will return to the *Big Challenge* again to pull everything together and create a solution.

When you work on a big project, it is useful to keep track of your progress and what you still need to do. You will use a *Project Board* to do that.

Be a Scientist

Introducing the *Project Board*

When you work on a project, it is useful to keep track of your progress and what you still need to do. A *Project Board* gives you a place to keep track of your scientific understanding as you make your way through a Unit. It is designed to help your class organize its questions, investigations, results, and conclusions. The *Project Board* will also help you decide what to do next. During classroom discussions, you will record the class's ideas on a class *Project Board*. At the same time, you will also keep your own *Project Board* page.

The *Project Board* has space for answering five guiding questions:

- What do we think we know?
- What do we need to investigate?
- What are we learning?
- What is our evidence?
- What does it mean for the challenge or question?

Each time you use the *Project Board*, you will record as much as you can in each column. As you work through a Unit, you will return over and over again to the *Project Board*. You will add more information and revise what you have recorded. Everything you write in the columns will be based on what you know or what you have learned. In addition to text, you will sometimes want to put pictures or data on the board.

To get started on this *Project Board*, review the questions you are answering and the challenge you are addressing. Your challenge is to design an enclosure for an animal that will allow the animal to behave as it would in its natural habitat and that will allow visitors and scientists to observe and study the animal. This will help you answer the questions: *How do scientists answer big questions and solve big problems?* and *Why do animals behave the way they do?* Record these questions in the top area of the *Project Board* as shown below.

How do scientists answer big questions and solve big problems? Why do animals behave the way they do?				
What do we think we know?	What do we need to investigate?	What are we learning?	What is our evidence?	What does it mean for the challenge or question?

As you create your *Project Board* for this Unit, you will focus on animal behavior and on making good observations. Think about what you know that would help you address the challenge. You might have experiences with animal behavior, the jobs of biologists, or making observations and inferences that will be important for addressing this challenge. You may also have some questions about zoos, zoo animals, or studying animals.

You will begin by focusing on the first two columns: *What do we think we know?* and *What do we need to investigate?*

What do we think we know?

In this column, you will record what you think you know that is important to the challenge. This might be what you know about animal behavior or about studying animal behavior. You might also want to record what you know about animal enclosures or the behavior of animals in captivity. You probably think you know a lot about animal behavior. Some things may not be completely accurate. It is important to record those things anyway, for two reasons:

- When you look at the *Project Board* later, you will be able to see how much you have learned.
- Discussion with your class will help you figure out what you need to investigate.

What do we need to investigate?

In this column, you will record the things you need to learn more about to address the challenge. You probably have many ideas now about what you need to investigate. Work with your class to get these ideas on the *Project Board*. Later in this Unit, you will add other questions. Later, you may find things you are confused about. You and your classmates might disagree about some ideas. You will be recording in this column what you do not understand well or what you disagree about.

Sometimes you will be unsure about how to word your idea as a question. One of the things your class will do together around the *Project Board* is turn the things you are curious about into questions you can investigate.

You will return to the *Project Board* many times in this Unit. You will continue to add information to the board. You will record many of the ideas you have and things you are learning. You will then see how your ideas change. By the end of the Unit, you will fill in all of the columns.

The *Project Board* is a great place to start discussions. You may find that you disagree with other classmates about what you have learned and the evidence for it. This is a part of what scientists do. Such discussions help participants identify what they or others do not understand well and what else they need to learn or investigate. The class will fill in the large *Project Board*. Make sure to record the same information on your own *Project Board* page.