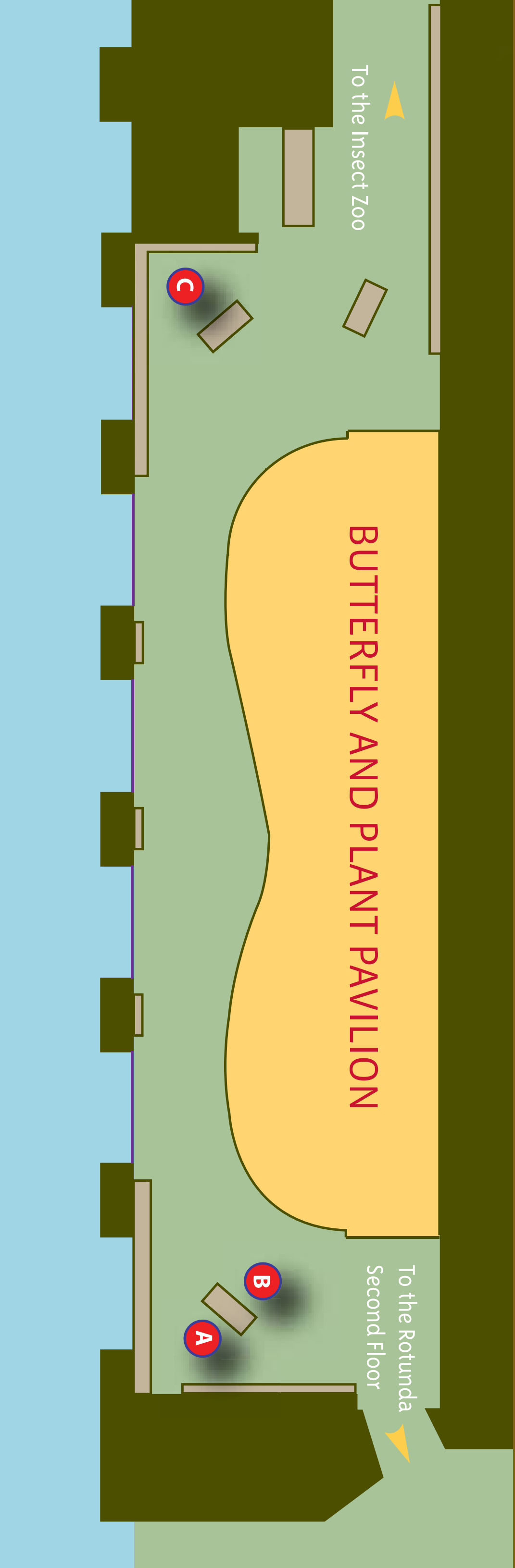


Butterflies + Plants: Partners in Evolution

MAP FOR ACTIVITIES

ANSWERS TO THE ACTIVITIES

Amber Fossil's Living Relative

Butterfly B is the closest living relative. It is *Voltinia danforthi*, a metalmark native to Mexico. It is the only butterfly sharing both characteristics with the fossil specimen. 1) It has a continuous ring of brown eye scales, and 2) the same brown colored palpi. The two characteristics were most likely inherited from the common ancestor of both species.

Scientist's Explanation for Convergent Evolution

Two structures are convergent if they function similarly but evolved separately in different species. Scientists look for convergent evolutionary patterns among nectar-feeding animals by looking for similarities in the ways different animals get at the same food resources. What is the length of the tongue and proboscis on each animal? How do they function?

Do they siphon, or are they textured for slurping nectar? What is the shape of the snout of a mammal, or the beak of a bird? How does that shape seem to determine which type of flower the animal can feed on? When you carefully compare the animals and plants in these examples, you can see that similar traits with similar functions evolved in animals that are not closely related to one another.

WEB RESOURCES

The Lepidopterists' Society
http://www.lepsoc.org

North American Butterfly Association
http://www.naba.org

Geologic Time, National Museum of Natural History
http://paleobiology.si.edu/geotime/main/index.html

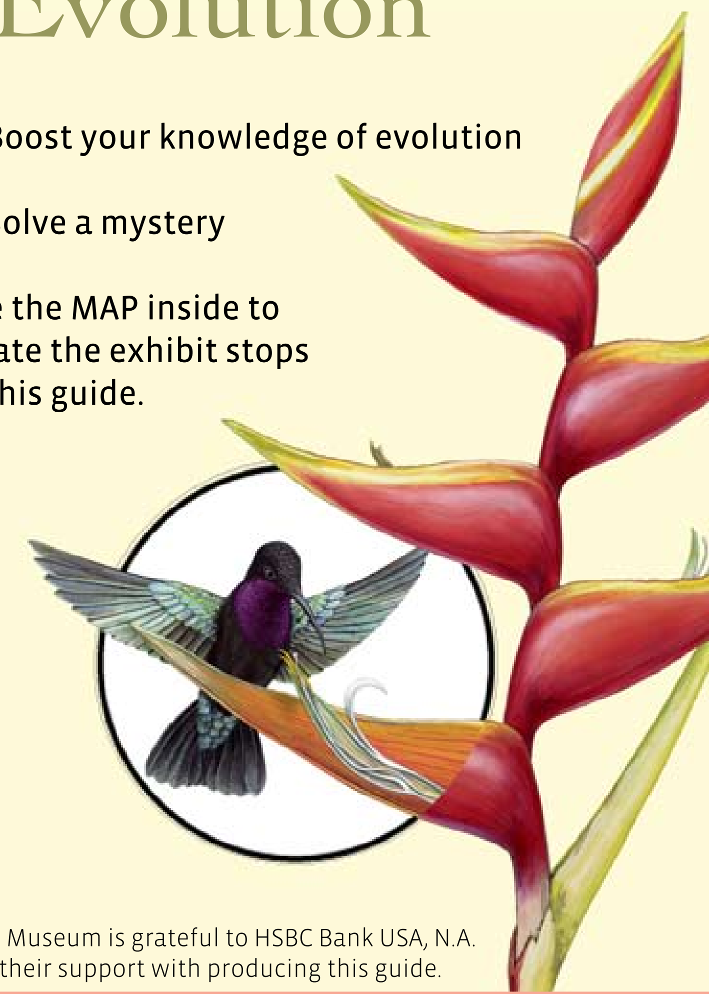
Understanding Evolution, University of California Museum of Paleontology **http://evolution.berkeley.edu/evolibrary/home.php**

Tree-Thinking: *Teaching and Learning about Evolutionary Relationships* **http://www.tree-thinking.org**

Butterflies + Plants: Partners in Evolution

- Boost your knowledge of evolution
- Solve a mystery

Use the MAP inside to locate the exhibit stops in this guide.



The Museum is grateful to HSBC Bank USA, N.A. for their support with producing this guide.

Use this guide in the exhibit

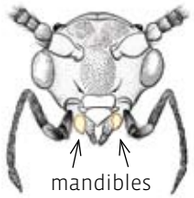
Smithsonian
National Museum of Natural History

STATION A (see the map)

The "Tongue" that Changed the World

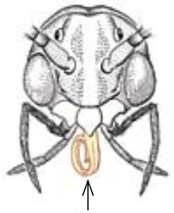
The Evolution of a Mouthpart

MOTH



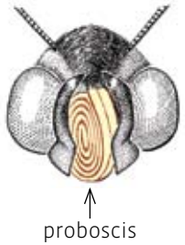
170 million years ago: during the Jurassic Period, moths had chewing mouthparts made of mandibles, as grasshoppers do today. Some moths used their mandibles to feed on pollen from non-flowering plants. Pollen-feeding moths still live today!

MOTH

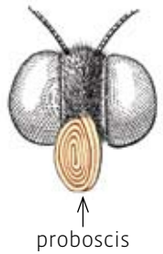


102 million years ago: during the **Cretaceous Period,** flowering plants began to evolve. Some moths had already evolved a short, tubular proboscis, a "siphoning tongue" to feed on liquids. These moths were ready to feed on the nectar produced by the flowers.

MOTH



BUTTERFLY



48 million years ago: during the **Paleogene Period,** butterflies evolved from moths with a proboscis rather than a chewing mandible. Butterflies and moths co-evolved with deep-throated flowers to have longer "tongues" (*i.e.* proboscises) to reach the nectar. The coevolution of flowers with moths and butterflies continues to this day. Today, there are butterflies and moths with proboscises long enough to reach the nectar hidden at the bottom of flowers as deep as 10 inches (25.4 cm)!

STATION B (see the map)

Solve the Mystery of a Fossil's Relative

Background

The fossil butterfly trapped in amber is 20 million-years old. Although extinct, it has close, living relatives.

Challenge

Find the closest modern relative of this extinct species.

How do I solve the mystery?

One way is to look for shared features between the fossil and other similar butterflies. The fossil is in the first row followed by three living species. Compare the eye scales and the palpus (one of two appendages around the mouth) for similar color patterns. Can you figure out which patterns are shared with the fossil, but not shared with another living butterfly? That is how a scientist would try to solve the mystery of discovering a fossil's modern relatives. When you solve the mystery, **check the back of this guide for the answer.**

VOLTINIA DRAMBA	SCALES	PALPUS
		
A 		
B 		
C 		

STATION C (see the map)

Decode Convergent Evolution

Background

The animals in this section of the exhibit are grouped together because they have independently converged to have special mouthparts that let them feed on plant nectar. For this activity, converge means to achieve a similar outward appearance from different starting points.

Challenge

Use the evidence in the exhibit to find the convergent patterns among the exhibit specimens. Then see if you can predict which animals feed on which flowers.

Suggestion: the video in the archway contains useful information on how different animals feed on flowers. The panel illustrations will help, too.

Step 1

Find these five animals in the exhibit area.
What physical features help each animal feed on nectar?

A. Honey Possum (video) B. Orchid Bee
C. Palamedes Swallowtail D. Lesser Long-tongued Bat
E. White-tipped Sicklebill

Step 2

Look at the flowers below. Based on their physical traits and what you observed about the animals, which flowers do you predict each animal will feed on? **Find an explanation on the back of this guide.**

FLOWER 1

FLOWER 2

FLOWER 3