



# Tusher African Hall Educator Guide

Grade 6 - Grade 12

What's Inside:

- A. EXHIBIT OVERVIEW**
- B. EXHIBIT MAP**
- C. KEY CONCEPTS**
- D. VOCABULARY**
- E. MUSEUM CONNECTIONS**
- F. RESOURCES**



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## Journey across the African continent, meet some of the animals that live there and learn about human evolution and migration.

**Welcome to Tusher African Hall where the focus is on the diversity of life found in Africa.** In this exhibit, students can explore the extreme landscapes and extraordinary diversity of life in sub-Saharan Africa, and learn that the continent is constantly changing. Through interactive stations in the exhibit, students can also learn about human evolution and our migration out of Africa, and the connections to climate changes back then.

With living and non-living dioramas, this exhibit displays a variety of African environments and the animals and plants found in them. Many dioramas in this exhibit are based on specific locations. These locations are noted throughout the guide. Touchscreens next to dioramas allow students to dive deeper into the habitats and the adaptations animals and plants have for living there.

An understanding of the variety of plants and animals found throughout Africa sets the stage for conservation awareness and environmental stewardship.

Tusher African Hall is organized geographically. Facing the penguin tank and moving counterclockwise around the hall, you will be visiting locations depicted in the dioramas as if you were traveling from southern Africa through the Great Rift Valley to the Somali Arid Zone.

**The following main themes are found in Tusher African Hall:**

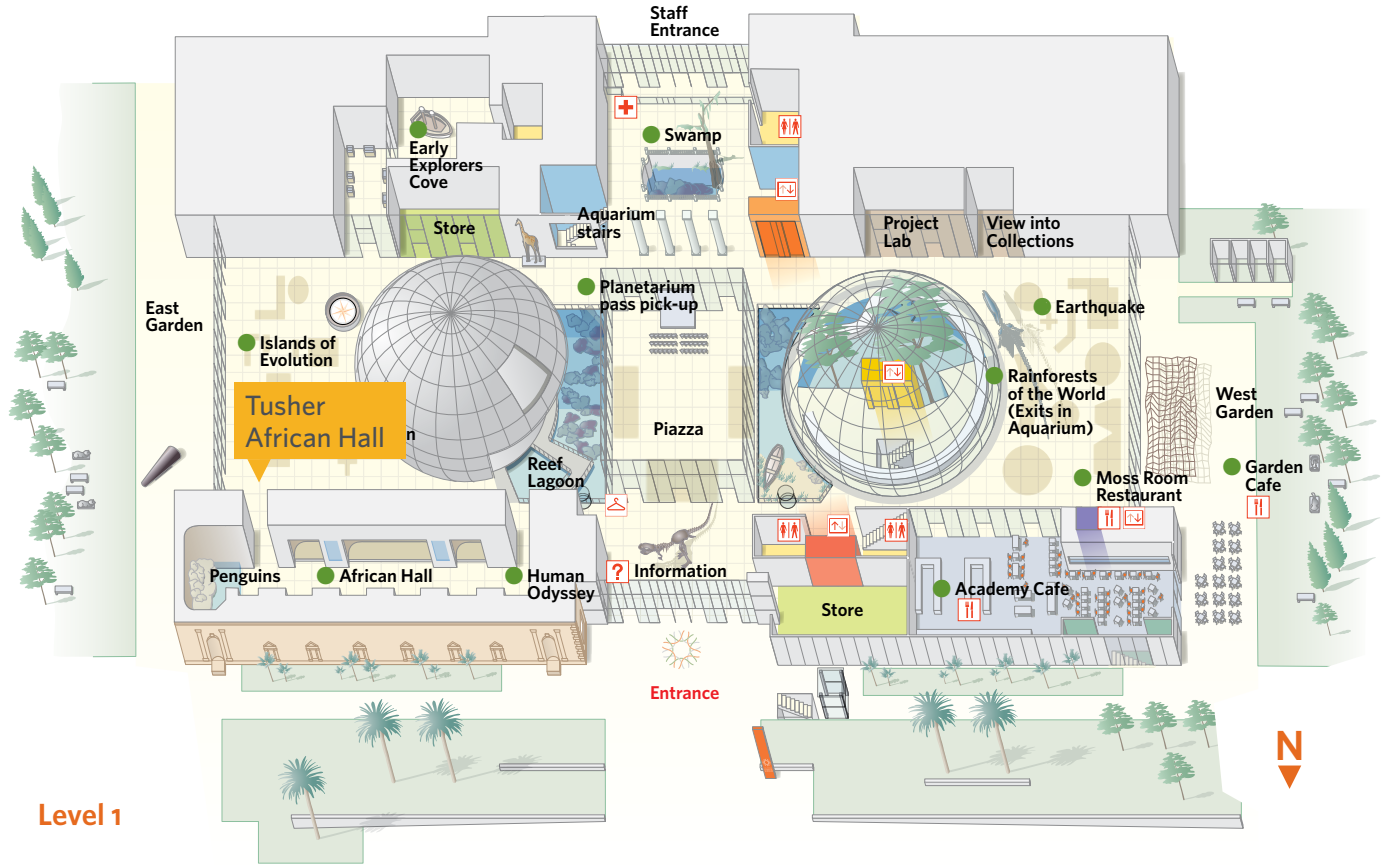
- » Africa is made up of many different ecosystems.
- » African plants and animals are uniquely adapted to live in their environments.
- » The many ecosystems found in Africa were the backdrop for human evolution.

**Use this guide to:**

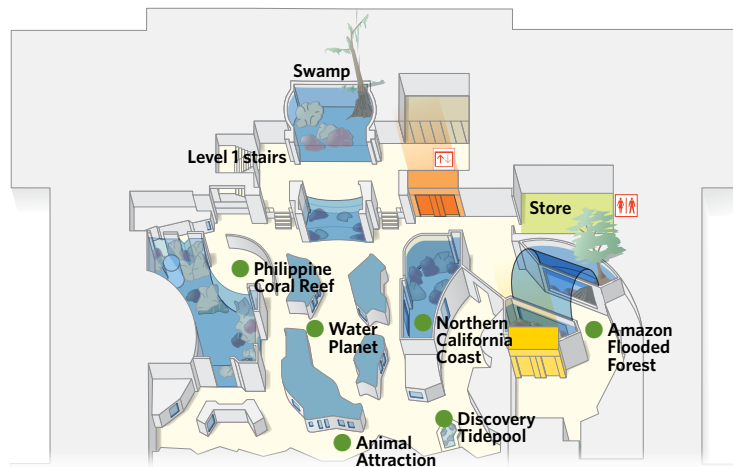
- » Plan your field trip to the California Academy of Sciences' Tusher African Hall.
- » Learn about exhibit themes, key concepts and behind-the-scenes information to enhance and guide your students' experience.
- » Link to exhibit-related activities you can download.
- » Connect your field trip to the classroom.



# California Academy of Sciences Map

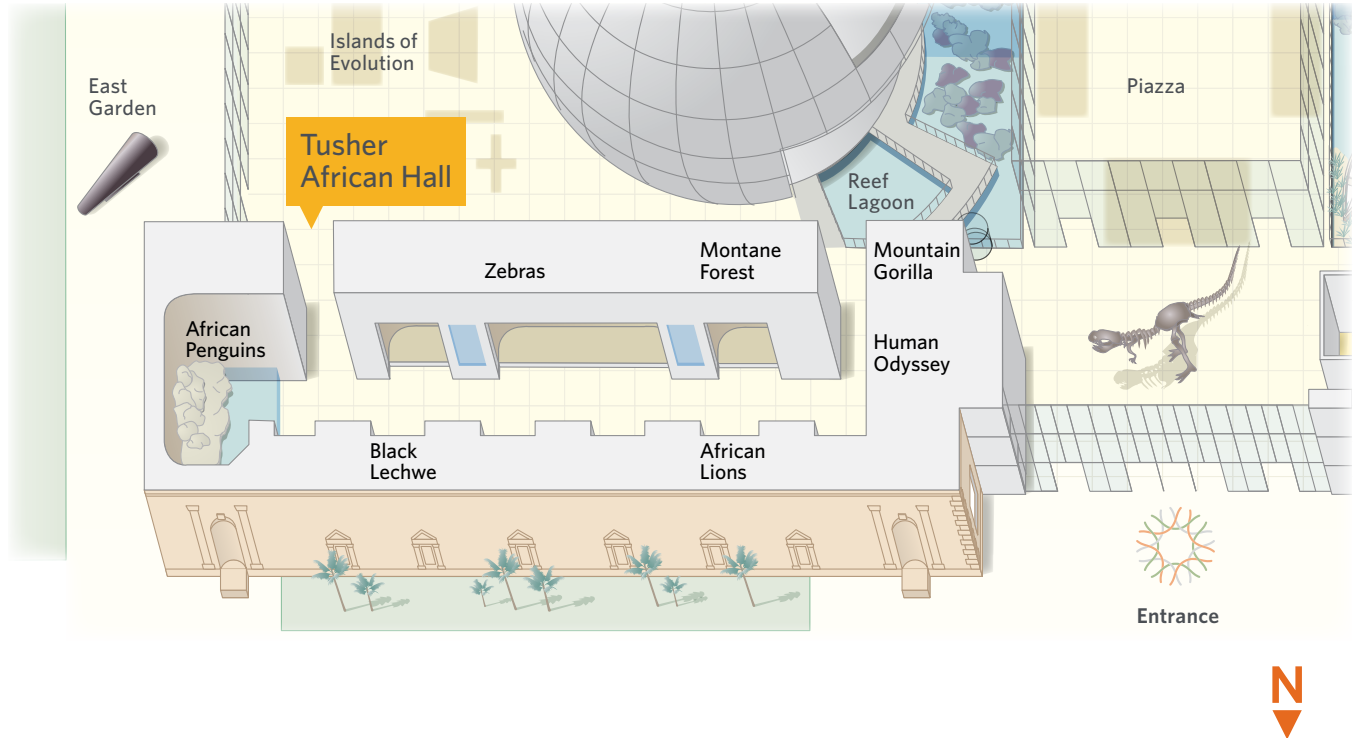


Level 1



Lower Level (Aquarium)

## Tusher African Hall Map

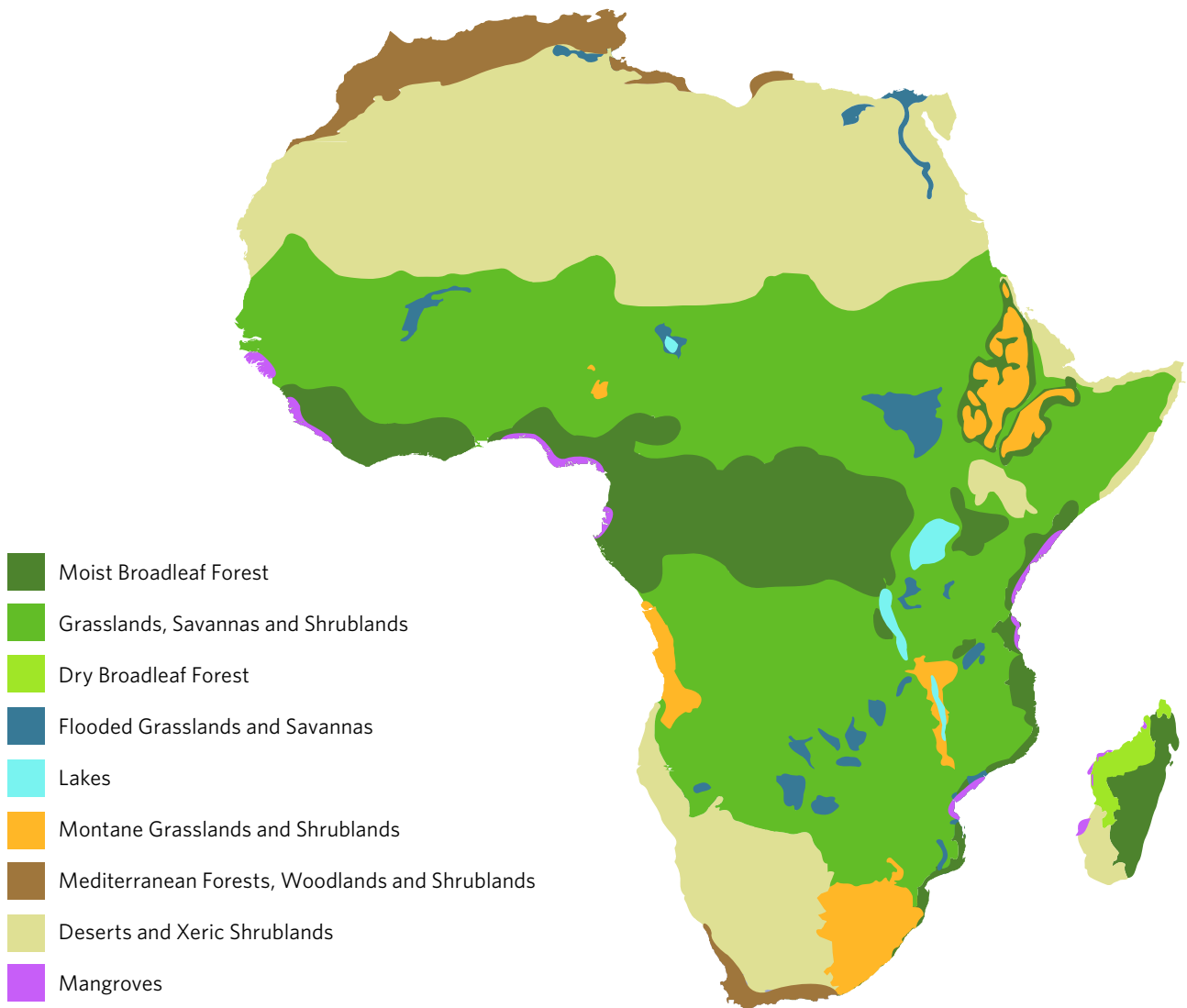


Found on Level 1, Tusher African Hall focuses on three main themes: Africa is made up of many different **ecosystems**; African plants and animals are uniquely adapted to live in their environments; and the many ecosystems found in Africa were the backdrop for human **evolution**.

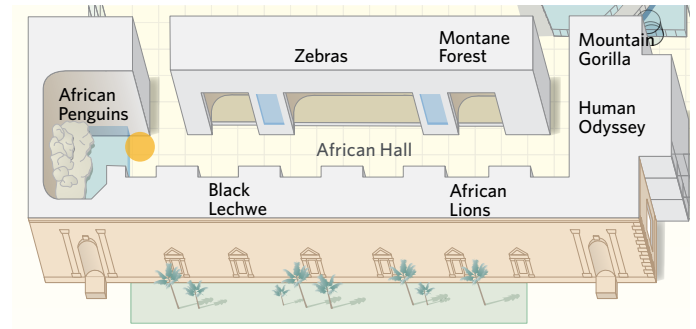
Your students will encounter an abundance of organisms, as well as interactive stations, video presentations and information panels. Before you visit the exhibit spend some time viewing the guiding questions and answers (page 26).

# Africa

In one of Earth's most spectacular places, Africa's diverse life embodies the challenges of survival and sustaining the balance of nature. Begin your journey at Africa's southern coast, traversing expansive savannas to dense bamboo forests.



## C. KEY CONCEPTS



## African Penguins

Penguins are part of the surprising diversity found in Africa.

### Main ideas:

- » African penguins are flightless and **adapted** for spending much of their time under water.
- » The color of their feathers camouflages them from both predators and prey. In water, their black backs are not easily seen from above, and from below, their white bellies blend in with the light coming from the surface. This is called countershading.
- » African penguins have black spots on their chest. These spots are unique to each penguin and remain in the same place even after the birds molt.
- » Most African penguins live on islands off Namibia and South Africa. A few mainland populations also exist such as Boulders Beach, South Africa which is depicted in the diorama.



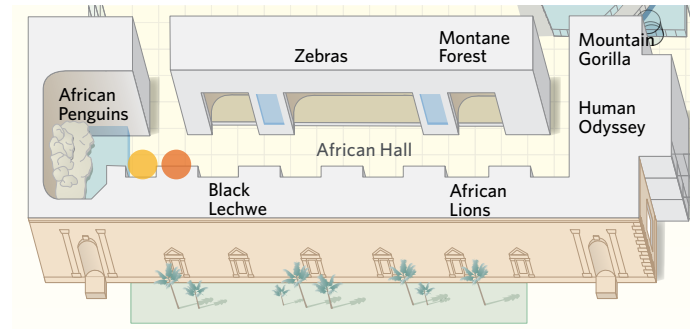
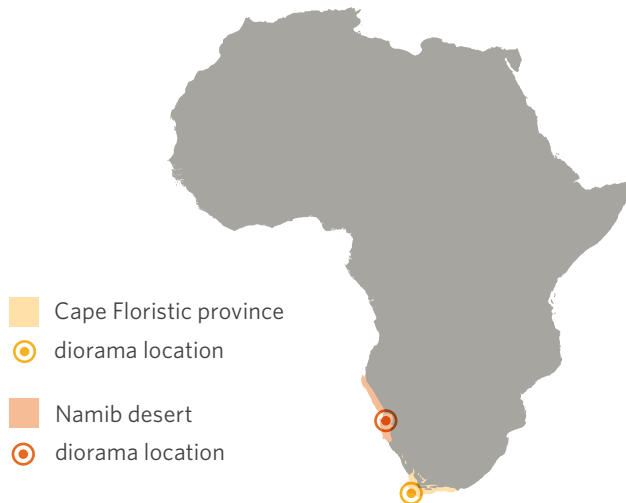
Scientific name:  
*Spheniscus demersus*

Watch our colony live on the penguin cam!  
Visit [www.calacademy.org/webcams/penguins/](http://www.calacademy.org/webcams/penguins/)

For more information on African Penguins, refer to the Specimen Spotlight on page 22.



## C. KEY CONCEPTS



## Cape Floristic Province

The Cape Floristic Province in South Africa is small but has the greatest diversity of plants outside of the tropics.

### Main ideas:

- » Found along the coastline of South Africa, this landscape is dominated by shrublands comprised of evergreen, fire-dependent plants that thrive on rocky or sandy nutrient-poor soils.
- » The Cape Floristic Province hosts over 9,000 different kinds of plants making it a **biodiversity hotspot**.
- » The climate found in the Cape Floristic Province is similar to the climate found in California.



King protea (*Protea cynaroides*) is one of the many hardy plants found in Cape Floristic province.

## Namib Desert



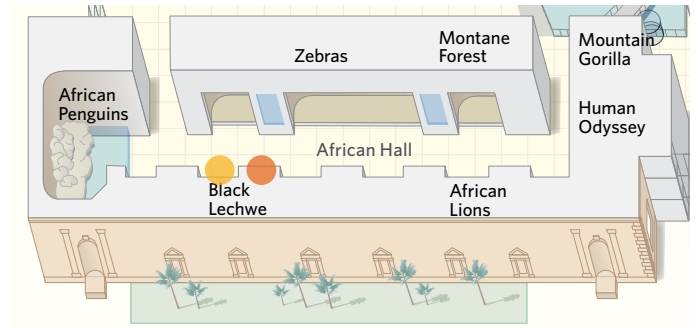
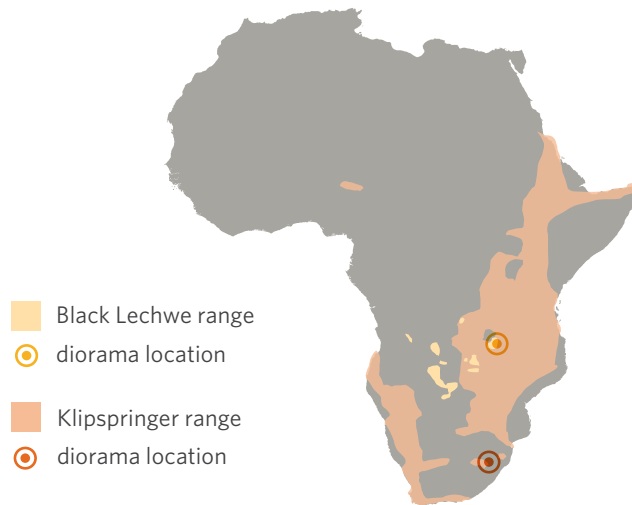
Dr. Robert T. and Margaret Orr © California Academy of Sciences.

Hardy plants and animals are adapted to survive in the Namib, the world's oldest desert.

### Main ideas:

- » Temperatures in the Namib Desert can rise as high as 49°C (120°F) and average annual rainfall is less than 20 cm (8 inches) per year. Along the western coast cool air is pressed down by the warm air from the east; this causes fog to form. This fog is an important water source in the life cycle of many desert plants and animals.
- » The *Welwitschia* plant has long, broad leaves that allow the coastal fog, which saturates the air each morning, to condense on its leaves.

## C. KEY CONCEPTS



## Black Lechwe



Scientific name:  
*Kobus leche smithemani*

Long-legged antelope use wetlands to their advantage.

### Main ideas:

- » Black lechwe spend much of their day wading in shallow water where they feed on aquatic plants.
- » The long, wide hooves of the black lechwe prevent them from sinking into the marsh ground and allow them to move quickly in knee-deep water and escape predators.
- » The glossy coat of the black lechwe is covered with a greasy substance that makes them water-repellent.

## Klipspringer

Rock-hopping klipspringers are specially adapted for life on high, rocky slopes.

### Main ideas:

- » Klipspringers are adapted to live on steep mountain slopes and rocky ledges. By moving quickly along the rocky outcrops klipspringers are able to evade predators.
- » As vegetarians, klipspringers feed on juicy succulents that grow on rocky outcrops. Klipspringers get all their hydration from the food they eat and never have to drink water.

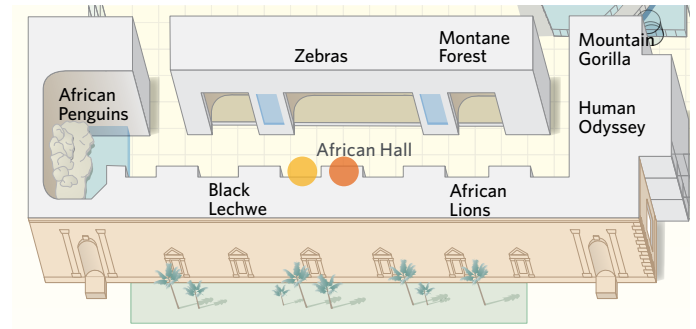
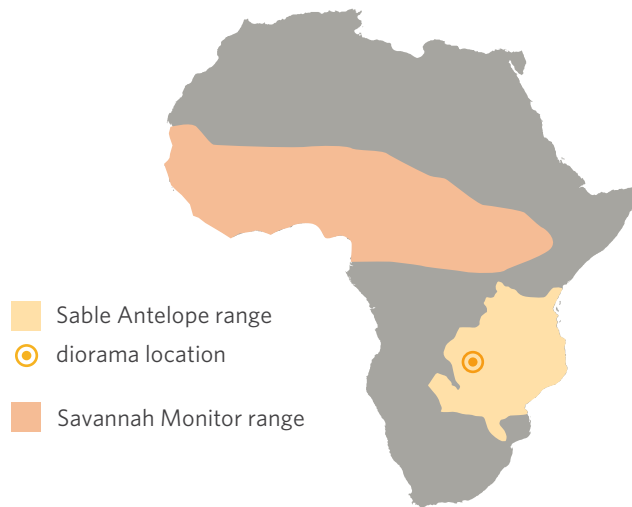


Scientific name:  
*Oreotragus oreotragus*





## C. KEY CONCEPTS



## Sable Antelope

Woodland savannas provide much-needed protection for sable antelopes.

### Main ideas:

- » Sables travel in herds of mostly females and avoid open plains where they might be easily targeted by predators.
- » A single dominant male will never be far from the herd and will always accompany them to water holes where predators often attack.



Scientific name:  
*Hippotragus niger*

## Savanna Monitor Lizard



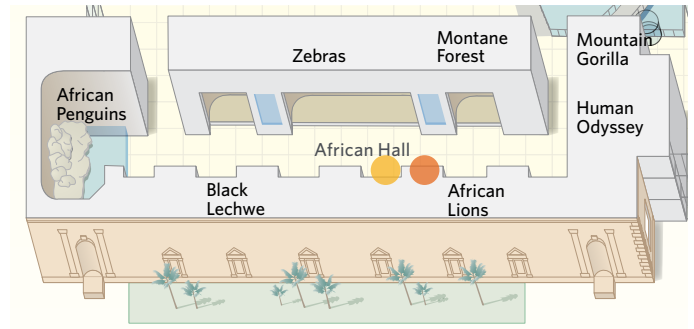
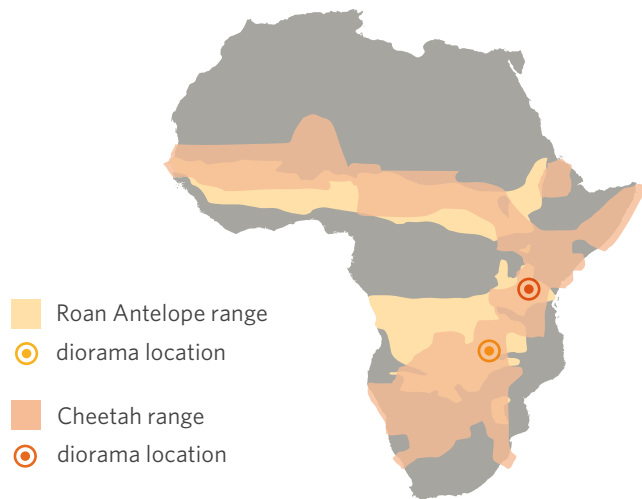
Scientific name:  
*Varanus albigularis*

Savanna monitors are generalist predators.

### Main ideas:

- » Monitor lizards will eat any animal that they can catch, overpower, and consume, including insects, birds, eggs, tortoises, and small mammals. They will even catch and kill snakes by violently flinging the snake from side to side.
- » These lizards can be found in aardvark burrows, rocky outcrops, tree holes, and abandoned termite hills.

## C. KEY CONCEPTS



## Roan Antelope

Fiercely territorial, roan antelope are one of the largest antelope species.

### Main ideas:

- » Rainy summers produce abundant vegetation in these woodlands, providing an important food source for many animals, including roan antelope.
- » Herds of roan antelope totaling five to 25 individuals are made up of females and their young plus a single male who excludes other males from the herd.
- » Both male and female roan antelope have horns; in males these horns are used to establish dominance. Males fight for dominance to maintain control over limited resources such as food, water, and nesting sites.



Scientific name:  
*Hippotragus equinus*

## Cheetah



Scientific name:  
*Acinonyx jubatus*

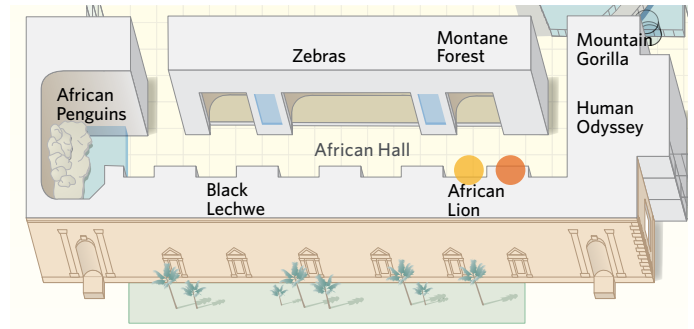
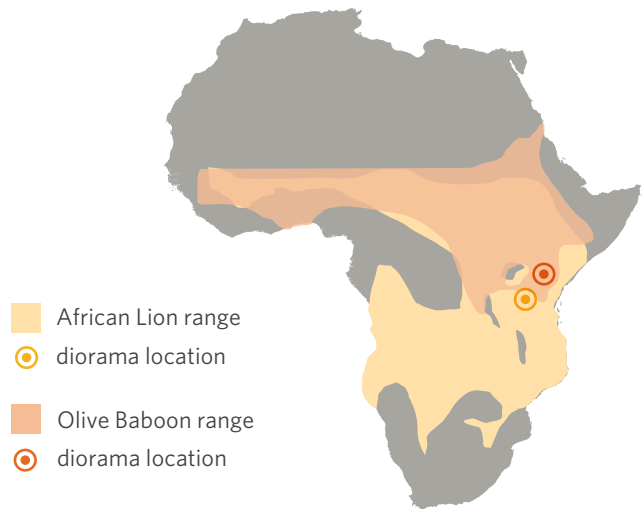
The world's fastest land animal may not be able to outrun its genetic limitations.

### Main ideas:

- » Unlike lions and leopards, cheetahs have lean bodies, long legs, and a small head—all adaptations for increasing speed in just a few strides to help catch their prey.
- » Cheetah populations have low genetic diversity. Because all the individuals are similar, they may all be affected in the same way by diseases or changes in the environment. This means the whole population could be wiped out by a single unfortunate event.



## C. KEY CONCEPTS



## African Lion

Top predators of the savanna, lions hunt herds of animals crossing the African plains each year.

### Main ideas:

- » Only mature male lions have a thick mane that makes them appear larger and protects their neck during attacks by other lions and hyenas.
- » Lions typically rest during the day to conserve energy for hunting in the evening and at dawn.
- » At the end of the rainy season, 1.5 million wildebeest migrate from their wet-season ranges to their dry-season ranges.
- » During migration, wildebeest are preyed upon by lions, hyenas, leopards, cheetahs, and crocodiles.



Look carefully at the background to see the wildebeest migration!

## Olive Baboon



Scientific name:  
*Papio anubis*

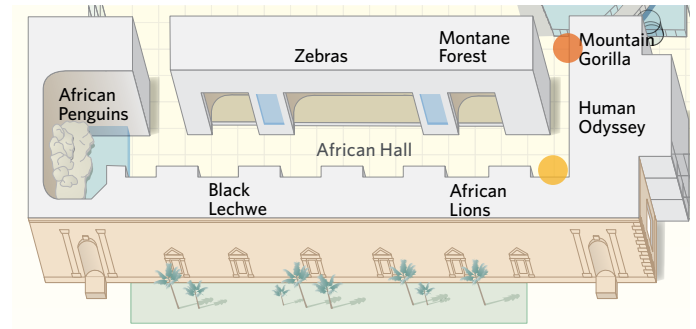
Olive baboons are among the most adaptable primates.

### Main ideas:

- » Olive baboons are opportunistic eaters and will eat almost everything they come across, including plant roots, flowers, seeds, snails, reptiles, eggs, and birds. Scorpions are eaten after the removal of the tail.
- » Olive baboons use over 30 vocalizations to communicate with each other, including grunts, barks and screams. They also use non-vocal communications such as lip smacking, shrugging, and yawns.



## C. KEY CONCEPTS



## Bushbuck

The Great Rift Valley is home to the bushbuck, an antelope that lives at the edges of forests.

### Main ideas:

- » Bushbucks are solitary animals that only form groups temporarily during mating season.
- » Their geometric white patches and spots make bushbucks well-camouflaged in the forest and thick brush.
- » Despite being a slow runner, the bushbuck is an excellent jumper.



Scientific name:  
*Tragelaphus scriptus*

## Mountain Gorilla



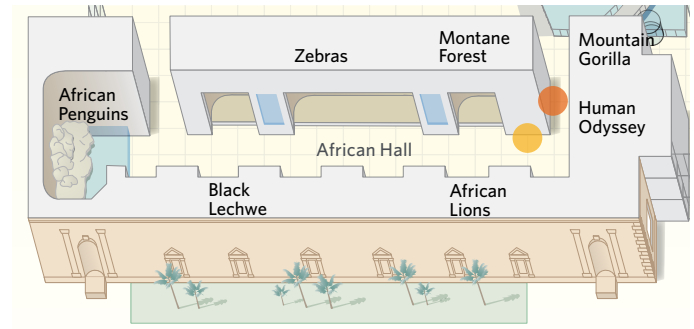
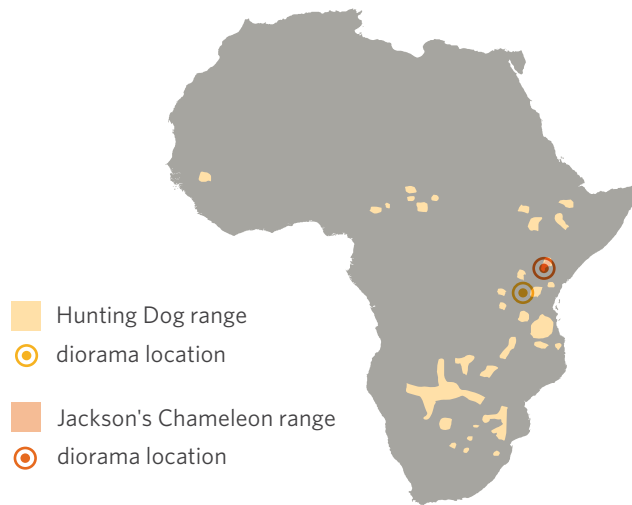
Even though they're protected in national parks, mountain gorillas are headed toward **extinction**.

### Main ideas:

- » Mountain gorillas live in the dense, mist-shrouded tropical forests of Africa's high-elevation volcanoes.
- » Gorillas have a wide range of vocal and physical communications including screaming, barking, and standing upright to deter predators or competitors.
- » The primary threat to the survival of mountain gorillas is humans. Poaching still occurs in national parks and human population pressures have forced agriculture and development into gorilla habitat.



## C. KEY CONCEPTS



## African Hunting Dog



Scientific name:  
*Lycaon pictus*

Hunting dogs play an important role in the natural balance of the savanna ecosystem but are becoming rare across the African landscape.

### Main ideas:

- » Once common across sub-Saharan Africa, hunting dogs have been shot and poisoned by hunters and farmers, significantly reducing their numbers. These animals presently have a limited range and survive only in scattered populations.
- » Hunting dogs hunt in cooperative packs, chasing down their prey in long open pursuits.

## Jackson's Chameleon

Chameleons have special adaptations that make them unlike any other lizard.

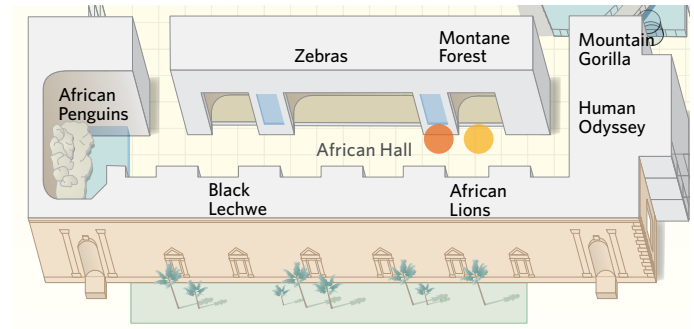
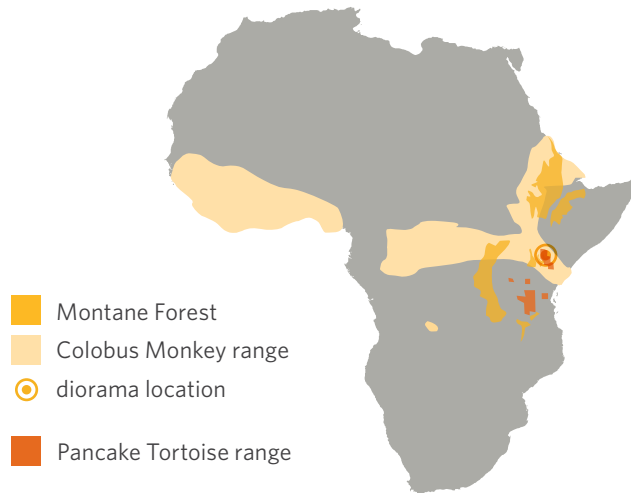
### Main ideas:

- » Chameleons change color based on the light and the temperature of their surroundings
- » The chameleon's body shape, movement, and base coloration all contribute to its camouflage.
- » Chameleons have feet and a prehensile tail uniquely adapted to climbing and a long tongue that can be shot at prey.
- » On either side of the head, their eyes move independently to track and zero in on prey.



Scientific name:  
*Chamaeleo jacksonii*

## C. KEY CONCEPTS



## Montane Forest

Forests on isolated mountains are like islands where unique life has evolved.

### Main ideas:

- » Elevation on these mountains range from 900 to 3,000 meters (3,000 to 10,000 feet) and the slopes are dominated by dense forests.
- » The thick forest and dense bamboo of East Africa's high mountains provide animals such as bongos and duiker with protective cover.
- » Black and white colobus monkeys spend most of their time in trees feeding on tender, young leaves. They rarely descend to the ground and instead navigate the forest by leaping across from branch to branch.



Scientific name:  
*Colobus guereza*

## African Reptiles

Rocky outcrops provide shelter for many types of animals.

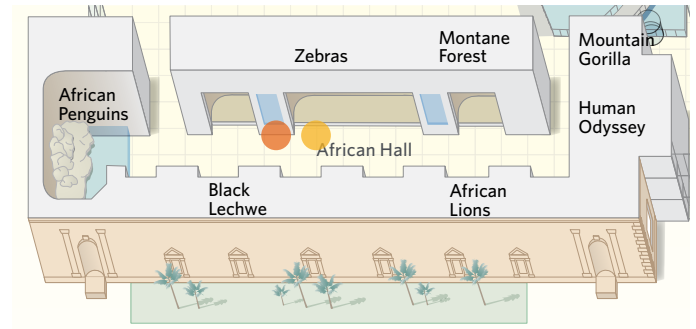
### Main ideas:

- » Reptiles have dry, waterproof skin that allows them to retain moisture and stay active in dry areas.
- » Rock outcrops provide an ideal location for reptiles to move between sun and shade and help them maintain a relatively constant body temperature.



Pancake tortoises (*Malacochersus tornieri*) have flexible shells and compactable bones that allow them to move into narrow crevices.

## C. KEY CONCEPTS



## Somali Arid Zone

Africa's Somali Arid Zone hosts a wide array of wildlife adapted to dry conditions.

### Main ideas:

- » Each zebra has a distinct pattern that acts as camouflage by breaking up the animal's outline.
- » Oryx have spear-like horns that are used for territorial dueling and defense against predators.
- » Gerenuks have long necks and use their front legs to pull down high branches and reach leaves high above other animals.
- » Leopards are excellent tree climbers and will sometimes haul their prey into trees and away from other predators.



Watch for the elephant herd moving in the background!

## Kirk's Dikdik



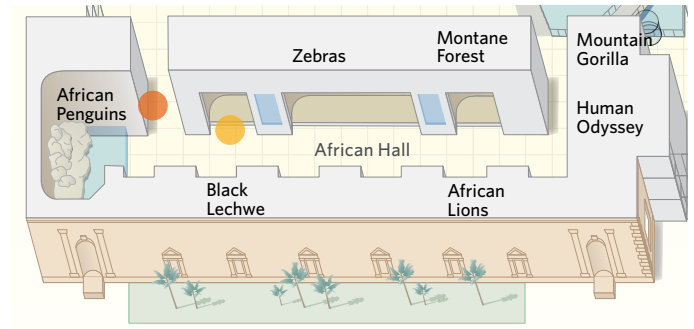
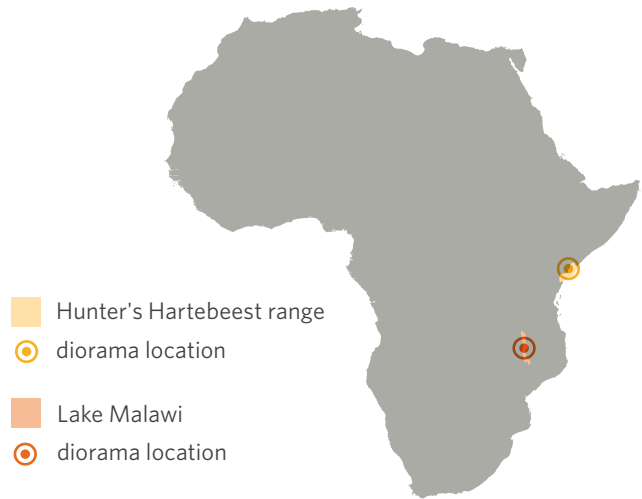
Scientific name:  
*Madoqua kirkii*

Tiny dikdiks are adapted for life in the hot, dry scrubland.

### Main ideas:

- » Dikdiks can withstand high temperatures during the day, but usually avoid the heat by being active only at dawn and dusk.
- » Male and female dikdiks mate for life and mark their territory with dung piles and a sticky secretion produced by glands under their eyes.
- » Water can be scarce in the scrubland; dikdiks get water from the leaves, the roots, the fruits and the berries they eat.

## C. KEY CONCEPTS



## Hunter's Hartebeest

Hunter's hartebeest is one of the most critically endangered antelope in the world.

### Main ideas:

- » Hunter's hartebeest inhabit a very restricted area in the arid, grassy plains along the border of Kenya and Somalia.
- » This species is critically endangered with only a few hundred individuals remaining in the wild. This decline in populations is thought to be due to severe drought and competition with grazing cattle.



Scientific name:  
*Beotragus hunteri*

## Lake Malawi cichlids



Lake Malawi hosts the greatest diversity of freshwater fish anywhere in the world.

### Main ideas:

- » Lake Malawi is thought to be a site of recent evolutionary radiation. This lake is home to over 1,000 species of cichlids, many of which are only found in Lake Malawi.
- » Some cichlids feed on algae, others eat fish or snails, while others feed on plankton. Specialized ways of feeding have helped different species of cichlids take advantage of every available **niche** in Lake Malawi.





# Human Odyssey



Daniel Furon © California Academy of Sciences

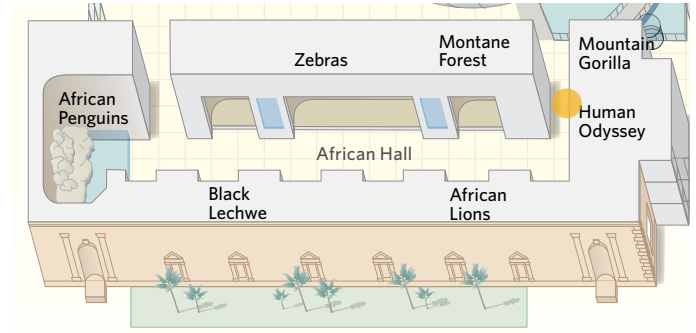
## Human Odyssey themes

**The story of human evolution unfolds in the unique ecosystems of Africa.**



Human Odyssey generously supported by Pauline and Tom Tusher

# Human Odyssey



## Walking with Lucy (*Australopithecus afarensis*)

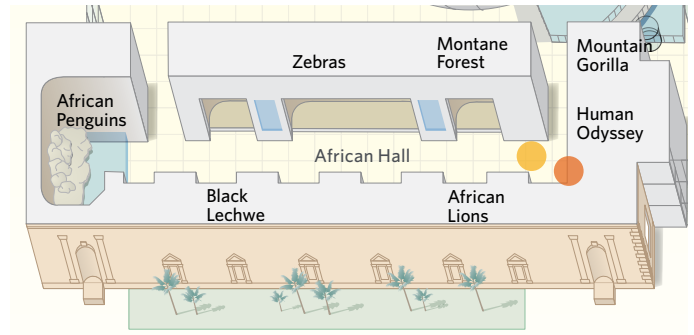
Watch the animation that compares upright walking between a modern chimp, Lucy, and a modern human.

### Main ideas:

- » Lucy's fossil skeleton is evidence of early human locomotion; her walk is more like that of a human than a chimpanzee.
- » Lucy and humans share some characteristics including a spine connection at the bottom of the skull rather than at the back that keeps the head at the proper angle when walking upright, angled thigh bones that place the weight over strong knee joints, and compact feet to support the full body weight.
- » Lucy and chimps both have shoulder blades and joints that are suited for climbing trees, and long arms and hands with curved fingers.



# Human Odyssey



## Face to Face

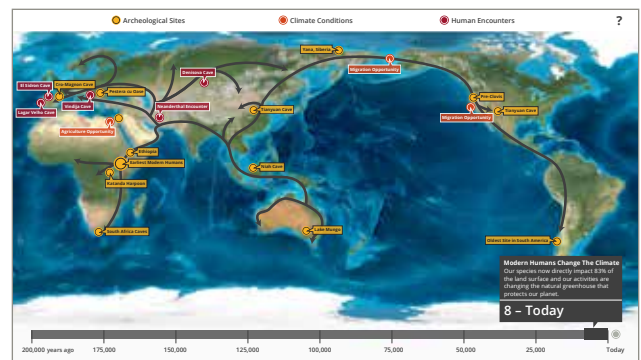


Look at the 3D skull and watch the video that points out key features, turn the knob to see a fleshed out reconstruction of the skull.

### Main ideas:

- » Fossil skulls hold clues to understanding the characteristics that made each early human species unique.
- » Using modern forensic reconstruction techniques, we can flesh out what our **ancestors** may have looked like.

## Migration Maps



Watch the video of human migration out of Africa. Use the touchscreen to explore routes within a timeline.

### Main ideas:

- » Advancing and retreating glaciers caused abrupt shifts between dry and wet conditions that were both barriers and opportunities to migration.
- » About 60,000 years ago, shortly after leaving Africa, modern humans met and interbred with Neanderthals.

Check out the interactive Human Odyssey map at <http://www.calacademy.org/human-odyssey/map/>

## Vocabulary

<b>adaptation</b>	a structure or behavior that increases an organism's chance of surviving and reproducing in a particular environment
<b>ancestor</b>	an earlier organism from which others are derived; a relative from the past
<b>biodiversity</b>	the variety of living organisms and the genetic differences among them
<b>biodiversity hotspot</b>	a region with high levels of biodiversity that is also threatened by human activity
<b>biome</b>	a region with a certain climate and certain forms of vegetation
<b>conservation</b>	the protection of natural environments and the ecological communities that inhabit them, often including the management of human use of natural resources for current public benefit and sustainable social and economic utilization
<b>descendant</b>	an organism that derives or descends from an earlier form (ancestor)
<b>ecosystem</b>	a community of living organisms and the physical environment with which they interact
<b>evolution</b>	change over time in the heritable traits within a population of organisms as successive generations replace one another; it is populations of organisms that evolve, not an individual organism
<b>extinct</b>	when all members of a particular species are no longer living



## Vocabulary

<b>lineage</b>	a continuous line of descent from a particular ancestor
<b>montane</b>	the lower vegetation belts on mountains
<b>niche</b>	the ecological role of an organism within an ecosystem
<b>ungulate</b>	a mammal with hooves



## Specimen Spotlight

### African Penguin

*Spheniscus demersus*

Did you know that penguins live in Africa? Most people associate penguins with ice and snow, but the African penguin lives in the rocky habitat along the coast of Namibia and South Africa.

African penguins have a black stripe under their chin and black spots on their chest. The pattern of spots varies in size and shape and is unique to each penguin, just like human fingerprints. Can you find the pink gland above the penguin's eye? This gland is used in thermoregulation (regulating body temperature). The warmer the penguin gets, the more blood is sent to the gland. The blood releases heat to the surrounding air and then circulates back to the rest of the body.

African penguins preen themselves and each other by rubbing their bills along their feathers. This cleans and straightens the feathers, aids in the removal of parasites, and spreads oil (which is produced by a gland at the base of the tail) across the feathers to make them waterproof.

African penguins form monogamous pairs and will return to the same nesting site every year. Females typically lay two eggs that are incubated by both parents. All penguins have a brood patch, a patch of bare skin at the base of their bellies; this allows the parents to provide direct body heat to their eggs.

Each penguin in our exhibit wears a colorful wing band, which helps Academy staff and visitors quickly distinguish one penguin from another.



Males are banded on the right wing, females on the left wing. Mated pairs typically have the same color wing bands and can often be seen grooming one another near the nest box they share.

The Academy exhibit closely mimics the penguins' natural environment through both its physical variability and changing climatic conditions. Through sophisticated use of light and temperature controls, the Academy penguin colony experiences sunrise, sunset, and everything in between. Water and air temperatures in the exhibit also change to mimic natural seasonal cycles.



## Science Behind the Scenes

### Researching Human Ancestors through Paleobiology

**Have you ever wondered how scientists study early humans and their environments?**



Image © Dikika Research Project

“Fossil sites in Ethiopia represent ‘hotspots’ for paleoanthropological studies,” says **Dr. Zeresenay “Zeray” Alemseged**, *Irvine Chair and Senior Curator of Anthropology at the California Academy of*

*Sciences in San Francisco.* “The earliest known anatomically modern *Homo sapiens*—modern human beings, very much like you and me—date back to 195,000 years ago and come from a site called Kibish in Southern Ethiopia.”

Dr. Zeray Alemseged is a paleoanthropologist at the Academy who studies early humans (*hominins*) and nonhuman primates. Through the discovery of fossils and archeological remains, scientists can learn about early human biology, culture, and ancient environments.

Paleoanthropologists search for bones, tools, footprints, butchery marks on animal bones and other evidence that shows where and how early humans lived. This evidence is mostly found on the surface (exposed by rain and wind) or by digging in the ground. By comparing the similarities and differences between fossilized bones and modern human bones, scientists can learn about the body form, physiology, and behavior of hominins. Tools, such as hand axes, made by early



Image © Zeresenay Alemseged

humans provide information about how hominins lived in their environment.

To better understand early humans, Dr. Alemseged initiated the Dikika Research Project (DRP) to study the anatomical changes of hominins over time and environmental transformations. In 2000 the DRP, led by Dr. Alemseged, found the fossilized skeleton of a child. Over the successive five field season, the team recovered the partial skeleton of Selam: the earliest and most complete juvenile ancestor ever discovered. They also found the earliest evidence for tool use and meat eating in the form of butchery marks on animal bones. Dr. Alemseged reminds us that, “Scientific research is a living and dynamic process and new discoveries continue to spark additional questions.”



## Related Exhibits

Visit our other exhibits for more examples of diverse ecosystems.

### Rainforests of the World



Expand your exploration of unique ecosystems in Rainforests of the World where your journey begins on the forest floor and takes you through the different levels of the rainforest. Explore the diversity of plants and animals found in tropical rainforests around the world, including equatorial Africa and Madagascar. Life in the rainforest has adapted to the presence of abundant water, long daylight hours, and seasonal flooding.

### California Coast



Dive into the underwater ecosystem of the northern coast of California, which contains some of the world's richest temperate marine ecosystems. A walkway along the surface allows visitors to smell the seawater and witness the tidepools along a small shore. Downstairs, visitors can see the kelp, eels, urchins, anemones, sea stars and fish that live beneath the water's surface. At the Discovery Tidepool in the California Coast exhibit, visitors can get up close and personal with the animals of the rocky intertidal zone and learn about the adaptations they have to live in this ecosystem.

### Philippine Coral Reef



Explore a tropical coral reef without getting wet in the stunning Philippine Coral Reef exhibit which focuses on the world's most diverse of marine ecosystems. The 25-foot deep, 212,000 gallon tank offers spectacular underwater views of reef algae and animals and focuses on their unique adaptations and ecological interactions.





## Suggested Activities to Download

Visit [www.calacademy.org/teachers/resources](http://www.calacademy.org/teachers/resources) to download activities to enrich your field trip experience.

- » **At-Academy Activity:** Predator Prey Scavenger Hunt (*suggested grades 3-8*)  
<http://www.calacademy.org/teachers/resources/lessons/predator-prey-scavenger-hunt/>  
This activity is a ready-made scavenger hunt. Just download, print, and make copies for your students! Don't forget to set the stage for the activity, and clarify any rules.
- » **At-Academy Activity:** African Safari Cards (*suggested grades 3-8*)  
<http://www.calacademy.org/teachers/resources/lessons/african-safari-cards/>  
This activity is a ready-made scavenger hunt. Just download, print, and make copies for your students! Don't forget to set the stage for the activity, and clarify any rules.
- » **At-Academy Activity:** Living Fossils Scavenger Hunt (*suggested grades 6-8*)  
<http://www.calacademy.org/teachers/resources/lessons/living-fossils-scavenger-hunt/>  
Through this scavenger hunt, students will observe examples of animals with evolutionarily primitive characteristics and record observations using drawings and words.
- » **At-Academy Activity:** Sketching in African Hall (*suggested grades 9-12*)  
<http://www.calacademy.org/teachers/resources/lessons/sketching-in-african-hall/>  
This activity is a ready-made sketching exercise. Just download, print, and make copies for your students! Don't forget to set the stage for the activity, and clarify any rules.
- » **Post-Visit Activity:** Whack the Word! (*suggested grades 3-8*)  
<http://www.calacademy.org/teachers/resources/lessons/whack-the-word/>  
After the museum visit, students will play a game reviewing vocabulary and life science concepts.
- » **Connected Experience:** Mystery Mammals (*suggested grades 2-8*)  
<http://www.calacademy.org/teachers/resources/lessons/mystery-mammals/>  
By being responsible for studying their own mystery mammal, students will become motivated to discover connections between animals and their habitats, and practice observation skills and detailed writing.
- » **Connected Experience:** Polygon Poetry (*suggested grades 3-8*)  
<http://www.calacademy.org/teachers/resources/lessons/polygon-poetry/>  
In this interdisciplinary problem-solving activity, students use themed poems to hunt for exhibit elements, connecting these points to form a simple shape. After recording distances between corners, they will convert measurements to solve a design problem.
- » **Connected Experience:** My Expedition to Africa (*suggested grades 3-8*)  
<http://www.calacademy.org/teachers/resources/lessons/my-expedition-to-africa/>  
In this unit for the classroom and museum gallery, students will classify living and nonliving components of their own diorama display, and construct a fictional narrative of an expedition to that particular habitat.
- » **Pre-, during-, and post visit activities:** short, lively activities to focus your class trip to the Academy.
- » **Connected experiences:** Activity combinations that extend the museum visit into the classroom.
- » **Anytime lesson plans:** Full-period lessons to integrate into your yearly curriculum.



## Suggested Activities to Download (continued)

» **Connected Experience: Eat or Be Eaten** (*suggested grades 3–8*)

<http://www.calacademy.org/teachers/resources/lessons/eat-or-be-eaten/>

Students will analyze the diverse physical and social adaptations of predators and prey featured in Tusher African Hall.

» **Connected Experience: Prove Me Wrong** (*suggested grades 3–8*)

<http://www.calacademy.org/teachers/resources/lessons/prove-me-wrong/>

Students will collect evidence from the exhibit to confirm or refute claims made by a hypothetical naturalist on his first visit to Africa. This game addresses potential misconceptions about the continent, and shows students how sound observations may still lead to invalid scientific conclusions.

» **Connected Experience: Antelope Across Africa** (*suggested grades 4–8*)

<http://www.calacademy.org/teachers/resources/lessons/antelope-across-africa/>

During a field trip to the California Academy of Sciences' Tusher African Hall students create a "field guide" for specific antelope. Back in the classroom the students match their antelope to **biomes** to which their antelope is specially adapted.

» **Anytime Lesson Plan: Ruminating on the Digestive System** (*suggested grades 5–11*)

<http://www.calacademy.org/teachers/resources/lessons/ruminating-on-the-digestive-system/>

Students will review the functions of basic digestive organs, and then step outside to compare the digestive systems of the buffalo and the zebra in a lively demonstration.

» **Anytime Lesson Plan: Wild Dog Urine** (*suggested grades 6–12*)

<http://www.calacademy.org/teachers/resources/lessons/wild-dog-urine/>

Students will read a newspaper article to learn why African wild dogs are under threat of extinction, and consider how conservation scientists work towards solutions that balance human and environmental needs.

» **Anytime Lesson Plan: Wild Dog Debate** (*suggested grades 6–12*)

<http://www.calacademy.org/teachers/resources/lessons/wild-dog-debate/>

Students will participate in a mock conference addressing wild dog conservation by playing the role of a specific stakeholder.

## CA Science Content Standards

### Grade Six

#### Life Sciences

5c: Organism populations

5d: Roles of organisms

5e: Factors influencing organisms in ecosystems

### Grade Seven

#### Life Sciences

3a: Causes of evolution

3c: Evolutionary theory

3e: Extinction

### Grades Nine through Twelve

#### Biology/Life Sciences

6a: Biodiversity

6b: Analyze changes in an ecosystem

6c: Fluctuations in populations

6g: Accommodation vs. adaptation

8d: Reproductive or geographic isolation

8e: Fossil evidence



## Guiding Questions and Answers

Use these questions to get students thinking about Tusher African Hall.

- » **Many species in Africa are becoming extinct. What are some causes of extinction? How can we limit the loss of biodiversity?**

Many African animals are becoming extinct due to habitat destruction, poaching and climate change. African hunting dogs have disappeared from most of their historic range due to urban and agricultural development, gorillas are subject to poaching even within national park boundaries, and Hunter's hartebeest populations have plummeted due to competition with cattle and persistent drought throughout the region. Awareness, education and protection of endemic species will ensure these ecosystems are preserved.

- » **Compare the biodiversity found in two dioramas. What factors might lead to the differences found in the biodiversity of the regions depicted in the dioramas?**

The sum total of different kinds of organisms living in an ecosystem is a measure of **biodiversity**; this includes all living organisms from plants to animals to bacteria. Biodiversity is not evenly distributed and different regions have varying amounts of biodiversity. Biodiversity hotspots in Africa include the Cape Floristic Province, the Somali Arid Zone and the montane forests and shrublands along the Great Rift Valley. Energy availability, environmental patchiness, niche specialization and species interactions are all thought to affect biodiversity.

- » **What evidence do scientists have that humans and apes shared a common ancestor?**

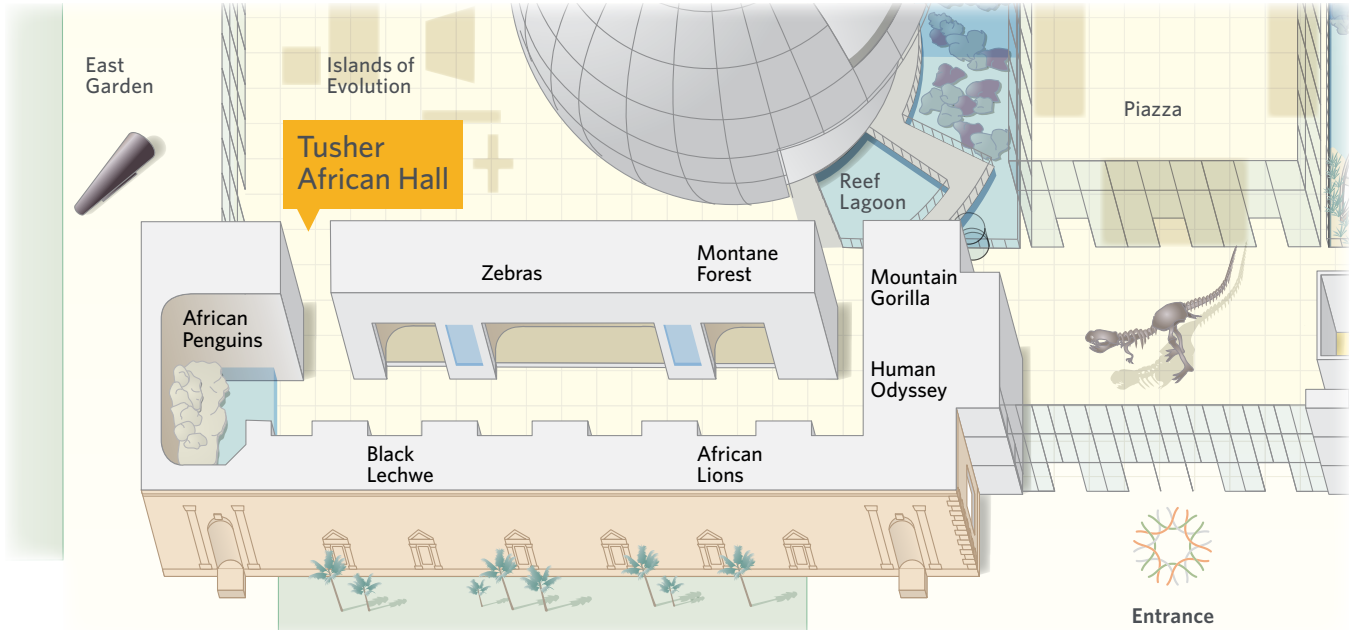
Fossil, archeological and DNA evidence show that humans and apes share a common ancestor. Ape and human-like fossil skulls and other skeletal body parts date back to 7 million to 5 million years before present. Humans and apes both use tools, and tools have also been found in archeological sites near human remains. Research shows that the DNA of humans and apes is highly similar.

- » **Watch the video of humans, chimpanzees and Lucy, the *Australopithecus*, moving. What is different about how each one moves? How does their movement relate to the structure of their skeleton?**

Structure and function are intimately connected. Humans walk upright, which requires balance, and legs that can support the entire weight of the body. Lucy's fossil skeleton is evidence of early human locomotion; her short, broad pelvis, thigh bones angled inward, and compact feet were capable of supporting her body when walking upright. The anatomy of chimpanzees directly relates to their locomotion. Chimpanzees have arms that are longer than their legs, and a short body. They usually walk on all four limbs using the soles of their feet and the knuckles of their hands.



## Tusher African Hall



**Welcome to Tusher African Hall,  
where the focus is on the variety of  
life found in Africa.**

Tusher African Hall focuses on three main themes: Africa is made up of many different ecosystems; African plants and animals are uniquely adapted to live in their environments; and the many ecosystems found in Africa were the backdrop for human evolution. Your students will encounter an abundance of organisms, as well as interactive stations, video presentations and information panels. Before you visit the exhibit spend some time viewing the guiding questions and answers.