

BODY WORLDS

ANIMAL INSIDE OUT



EDUCATOR'S GUIDE

Grades 1 – 3

CLASSROOM ACTIVITIES

These classroom activities can be used as either pre-visit activities to prepare students for *BODY WORLDS: ANIMAL INSIDE OUT* or as post-visit activities to help with debriefing.

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Thanks to the Perot Museum of Nature and Science
for the initial development of these educational materials.

Per[]t
Museum of Nature and Science



EXHIBITION OVERVIEW

BODY WORLDS creator and anatomist, Dr. Gunther von Hagens, takes you on an anatomical safari with *ANIMAL INSIDE OUT*. As you explore this captivating exhibition, you will experience the intricate anatomy and physiology of a variety of the world's most spectacular creatures. *ANIMAL INSIDE OUT* contains more than 100 specimens that have been painstakingly preserved by the remarkable process of Plastination, invented by Dr. von Hagens. Students will be able to examine the anatomical intricacies of familiar and exotic animals like giraffes, camels and octopuses.

This exhibition is an unforgettable way for students to learn about animal science.

The exhibition explores:

Skeletons

From tiny insects to full-grown mammals, most animals have a skeleton of some sort. It could be an endoskeleton, which humans have, or an exoskeleton like that of insects and crustaceans.

Muscles, tendons and ligaments

From the large running and leaping muscles of a caribou, to the specialized muscles of a bull's heart that pump the blood and nutrients around its body, *ANIMAL INSIDE OUT* reveals the intricacy and details of the muscles and ligaments that most animals have.

The nervous system

A vast and complex network that connects the brain, spinal cord and all parts of the body. It channels data continuously and transmits commands. The nerve fibres that carry this vital information can be finer than a human hair and invisible to the naked eye.

Reproduction

After feeding, reproduction is the most essential activity of an animal. Evolution has developed a number of ways for animals to reproduce.

Respiration and digestion

By viewing the lungs and digestive tracts of animals, like the caribou, we can see how we share the same intricate details of many major organs.

Wildlife conservation and preservation

By learning how similar animals and humans are, visitors will be able to gain a new appreciation for the importance of animal welfare.

Caution for sensitive viewers:

ANIMAL INSIDE OUT features a few human organs and body parts, as well as a male body plastinate with eyes and genitals. This material is included for the comparison of human anatomy to that of other animals.

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CURRICULUM LINKS

While visiting this exhibition, students will be using the processes and skills of science. Young children naturally have an interest in animals and this provides the motivation and inspiration for them to practice thinking like a scientist does. Students will be able to describe and compare their observations and ideas with each other and learn about the nature of science. For older students, direct experiences with the specimens will challenge them to practice important science skills and develop hypotheses and conclusions about animal science, diversity, change over time and the processes of science. Teachers can use student experiences in *ANIMAL INSIDE OUT* to support student learning in life science, as well as providing experiences for contextual reading and writing applications.

- » **Grade 1 Topic E**
(Needs of Plants and Animals)
- » **Grade 2 Topic E**
(Small Crawling and Flying Animals)
- » **Grade 3 Topic E**
(Animal Life Cycle)

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FIELD TRIP INFORMATION

FOR PARENTS/GUARDIANS

What is the purpose of the exhibition?

The purpose of *BODY WORLDS: ANIMAL INSIDE OUT* is to inspire a deeper appreciation and respect for the animal world. Thanks to the science of Plastination, visitors can examine the intricate anatomy and physiology (blood vessels, muscles, bones, organs and nerves) of some of the world's most spectacular creatures. Visitors will be better able to understand the inner workings of animals and all the systems that enable them to live, thrive and survive (e.g. nervous, muscular, circulatory, respiratory, digestive and reproductive).

What kinds of specimens are displayed in this exhibition?

ANIMAL INSIDE OUT includes full body plastinates as well as cross-sections, skeletons, blood vessel configurations and organs. The inclusion of human plastinates allows for the comparison of human anatomy to that of other animals in the exhibition, resulting in a new understanding and appreciation of the similarities between animals and humans.

Where did the specimens on display come from?

ANIMAL INSIDE OUT is made possible through cooperation with various university veterinary programs, zoos and animal groups. No animal was harmed or killed for this exhibition. Among the plastinates in the exhibition are human specimens, including a full body plastinate that came from the Institute for Plastination's consented body donation program.



Giraffe

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Is this exhibition appropriate for children?

ANIMAL INSIDE OUT was designed for visitors of all ages to better understand animal anatomy. The content is factual, instructive and is presented in a non-sensational manner, but some content may require explanation by a parent or teacher. Along with informative displays that show animals' nervous, muscular, digestive, respiratory and circulatory systems, the exhibition also includes reproductive systems. Among the 100 specimens on display, you will see the following:

- » A blood vessel configuration of a horse's penis
- » A blood vessel configuration of a bull's testicle
- » A human placenta
- » A male caribou's reproductive organs
- » A caribou uterus
- » A fetus inside a caribou uterus
- » A cross-section of a duck developing an egg

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Ostrich

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INTRODUCTION

TO THE ACTIVITIES

In these activities, students will discover the similarities between animals and humans as well as their differences, which are adaptations that allow them to survive in their habitats. These activities are recommended for use as either pre-visit activities, before your class trip to *BODY WORLDS: ANIMAL INSIDE OUT*, or as post-visit materials to help debrief your class.

Objectives

- » Compare the anatomy of humans to animals
- » Discover adaptations that make animal groups different from one another

Curriculum Connections by Grade

- » **Grade 1 Topic E**
(Needs of Plants and Animals)
- » **Grade 2 Topic E**
(Small Crawling and Flying Animals)
- » **Grade 3 Topic E**
(Animal Life Cycle)

Vocabulary

- | | | |
|---------------|------------|--------------------|
| » adaptations | » arteries | » digestion |
| » oxygen | » blubber | » digestive system |
| » nutrients | » saliva | |

Literature

- » *Why Do Owls and Other Birds Have Feathers?* by Holly Beaumont
- » *Why Do Monkeys and Other Mammals Have Fur?* by Holly Beaumont
- » *Incredible Ears Up Close* by Melissa Stewart
- » *Terrific Tongues Up Close* by Melissa Stewart
- » *Bone by Bone: Comparing Animal Skeletons* by Sara Levine
- » *Zoology for Kids: Understanding and Working with Animals, with 21 Activities* by Josh and Bethanie Hestermann

Other Resources

- » Anatomy Games to Teach Kids About the Human Body
kids-activities-learning-games.com/anatomy-games.html
- » Tiny Rotten Peanuts | Anatomy Art Projects
tinyrottenpeanuts.com/anatomy-art-projects
- » Home Science Tools | Whale Blubber Experiment
hometrainingtools.com/a/whale-blubber-project
- » Blog She Wrote | Measuring Lung Capacity
<http://blogshewrote.org/2016/04/11/science-quest-measuring-lung-capacity/>

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ACTIVITY 1

WHAT'S INSIDE?

Activity Length

1 hour

Activity Type

Activity

Introduction

If you compare your body to the body of an animal, you'll see that we have some of the same characteristics, but we also have differences. We all breathe, move, eat, reproduce, live in habitats that we have adapted to for survival and we are all made of cells. A human, like all mammals, has a skeleton, heart, stomach, lungs and intestines. Fish also have skeletons, stomachs and hearts, but breathe using gills rather than lungs. An insect has an exoskeleton (a hard shell) and an octopus doesn't have a skeleton at all. Scientists group animals based on features that they can observe, such as whether or not the animal has a backbone, whether or not it has fur (or feathers or scales) or by how many legs it has.

Materials

Per student:

- » Large sheets of paper
- » Art materials (pencils, crayons, paint)

What to Do

1. Ask students to find a partner.
2. Ask each student to trace their partner's body on a large sheet of paper.
3. Discuss the internal parts of the body (heart, lungs, stomach, intestines, skeleton, etc.).
4. Ask students to add bones and/or organs to their drawing.

For inspiration, visit

- » Tiny Rotten Peanuts | Anatomy Art Projects
tinyrottenpeanuts.com/anatomy-art-projects

Extensions

After visiting *BODY WORLDS: ANIMAL INSIDE OUT*, make large outlines of animals and draw some of their internal organs or bones inside.

- » What are the differences between animal bodies and human bodies?
- » What differences did you notice between different kinds of animals?

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ACTIVITY 2

YOUR AMAZING, BEATING HEART

Activity Time

30 min.

Activity Type

Activity

Introduction

The heart is a muscle that pumps blood through the body. It sends fresh blood with oxygen and other important nutrients out via the arteries and brings back old blood with carbon dioxide and waste through the veins.

Materials

- » A stethoscope (optional)

What to Do

Preparation:

1. Introduce students to the heart muscle and how it works by showing a child-friendly video about the functions of the heart, such as:
 - » Magic Box Animation | Heart—Human Body Parts
youtube.com/watch?v=gxUNxvsG7lc
 - » They Might Be Giants | The Bloodmobile
youtube.com/watch?v=Futnu_6NmQo (suitable for older students)
2. Have the students feel their heartbeats (by holding a couple of fingers against the carotid artery in their necks). If available, have the students use a stethoscope to listen to the sounds of their heartbeats. Ask them to tap on the table, when they feel their heartbeats.
3. Ask the students to exercise, by running in place or jumping and then ask them to feel their hearts again. What feels different this time?

Key Questions

- » Why does your heart beat differently after exercise?

Extensions

- » Healthy Heart Song (Music to the tune of Frère Jacques)

My heart's beating, my heart's beating.
Thump, thump, thump! Thump, thump, thump!
It's slower when I'm sitting. It's slower when I'm sitting.
Sit and rest, sit and rest!

My heart's beating, my heart's beating.
Thump, thump, thump! Thump, thump, thump!
It's faster when I'm moving. It's faster when I'm moving.
Hop and jump. Hop and jump!

- » Exercise helps strengthen our hearts. Have the class create a list of heart-healthy exercises. Take time every day to partake in these types of exercises. Use the Simon Says game as a format, or simply put on some good music and dance!

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ACTIVITY 3

ADAPTING TO COLD CLIMATES

Activity Time

45 min.

Activity Type

Demonstration

Introduction

Humans and other animals find ways to adapt to their surroundings. To keep yourself warm in the winter, you wear clothes suited for the weather. When it is hot, you may wear a sunhat, sunglasses and sunscreen. Animals and people often head to the shade to cool off as well. What do people do to help them with climate changes? What type of habitat is important for caribou? A caribou can survive in very cold (extreme) temperatures because of its hair.

The hair is hollow like a straw and traps air inside to keep the caribou warm. The air is trapped close to the body to act like a winter coat. What do camels use to survive in the heat and cold of the desert? How do sharks keep moving when they swim into cold waters? What do you do to stay warm? Animals of all types have developed certain ways (adaptations) to stay comfortable in their habitats.

In this demonstration and exploration, students will observe a property of whales that keeps them warm when they are in very cold water. Whales have a thick layer of fat under their skin called blubber. The blubber keeps them warm and also stores nutrients their body can use when they are in waters where there isn't much food.

Materials

- » Large container of ice water
- » 4 Ziploc® sandwich bags
- » Vaseline
- » Timer

What to Do

1. Turn one of the Ziploc bags inside out and place it inside another bag. Make sure you have the “zippers” lined up correctly so that you will be able to zip the two bags together.
2. Fill the space between the two bags with a thick layer of Vaseline and then zip the bags together. This makes a type of glove with an opening for your hand to go in. The fat molecules in Vaseline make the space between the bags act a little like blubber.
3. Make a control glove by putting the other two Ziploc bags inside each other. This will give you the same amount of plastic, but no insulating “blubber” layer.
4. Ask students to line up and give each of them time to feel the difference when they put their hands in the control glove compared to the blubber-layer glove.
5. Ask the students to put one hand in the control glove and stick it in the ice water. Time how long they can keep their hand in the water before it gets too cold for them.
6. Now have them put a hand in the glove with the blubber and submerge it in the water. Time how long they can keep it there. Ask then which glove allowed them to keep their hand in the water longer?

Key Questions

- » Why is blubber important? How does blubber help whales survive in cold water?

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ACTIVITY 4

DIGESTION BEGINS IN THE MOUTH

Activity Time

30 min.

Activity Type

Activity

Introduction

Humans eat a variety of foods like bread, rice and crackers that are made of starch. As teeth crush and grind the food we eat into smaller pieces, an enzyme in our saliva begins breaking down the starch into sugar. This is one of the first steps in digestion. It happens even before food is swallowed.

Materials

- » Saltine crackers

What to Do

- » **Caution: gluten-sensitive students should not participate in this activity**

1. Give each student a cracker.
2. Have them place the crackers on their tongues. Ask them not to chew the cracker.
3. Wait a few minutes.
4. Now, ask the students what happened when they put the crackers into their mouths at the beginning of the activity.
5. Look at the label on the package. Explain that crackers are made from flour and have little or no sugar. The sweet taste they experienced meant that an enzyme in their saliva had started to break down the starch into sugar.

Key Questions

- » Why didn't you need to chew the cracker?

Extensions

- » Do all animals have teeth? Saliva? Investigate different types of animals and how and what they eat.
- » Explore more activities on digestion:
Kids Health in the Classroom | Digestion
kidshealth.org/classroom/prekto2/body/systems/digestive.pdf

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ACTIVITY 5

PERISTALTIC PINCH

Activity Time

15 min.

Activity Type

Demonstration

Introduction

Peristalsis is a pinching action by the muscles in the esophagus and intestines that moves food through the digestive system after it is ingested. This demonstration uses a model made from easy-to-find materials, to explain how food is moved through the digestive system.

Materials

- » hollow, stretchy rubber tube (not a garden hose) or a long “animal” balloon with the ends cut off
- » marble or small ball (small enough to fit in tube)
- » funnel
- » cooking oil

What to Do

1. Explain to students that you are going to show them how food is moved through the digestive system.
2. The rubber tube represents intestines. Intestines have mucus in them. Drip a bit of oil into the tube (use a funnel) to represent the mucus.
3. Put the marble into the end of the tube that the oil went in and pinch behind the marble to move it along the tube. Explain that the marble represents a ball of food.
4. Show the students where their esophagus is located by pointing at the front of your neck. Explain that the esophagus is a tube that connects the mouth to the stomach inside our neck.
5. Muscle waves along the esophagus help squeeze food to the stomach. This process is called peristalsis. Your esophagus muscles take seven seconds to push a ball of food from your throat to your stomach.

Key Questions

- » Do you control the muscles of your esophagus?

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AMAZING FACTS

Human intestines
are at least 7.5 metres long in an adult.

Be glad you're not a full-grown horse—
their coiled-up intestines are 27 metres long!

Digestion from mouth to anus takes about 72
hours compared to 6 to 8 hours for humans.

Horses don't have
gall bladders, bile from the liver flows
directly into the small intestine.

Some animals like
seahorses, lungfishes and platypuses
have no stomach. Their food goes from
the esophagus straight to the intestines.

Chickens and other birds
don't have teeth.

They have a gizzard that stores small stones
which are used to grind hard foods like seeds.

The owl swallows its prey whole,
including the bones. When it has digested the
edible parts of its food, the bones and the other
non-digestible parts are pushed out through its
mouth in a small ball called a pellet.

Horses can't throw up.
This is because the esophagus in
a horse has a one-way movement.
It prevents feed from coming back up.



Horse

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Giant squid
can snatch prey
up to 10 metres away by
shooting out their two feeding tentacles,
which are tipped with hundreds of
powerful sharp-toothed suckers.

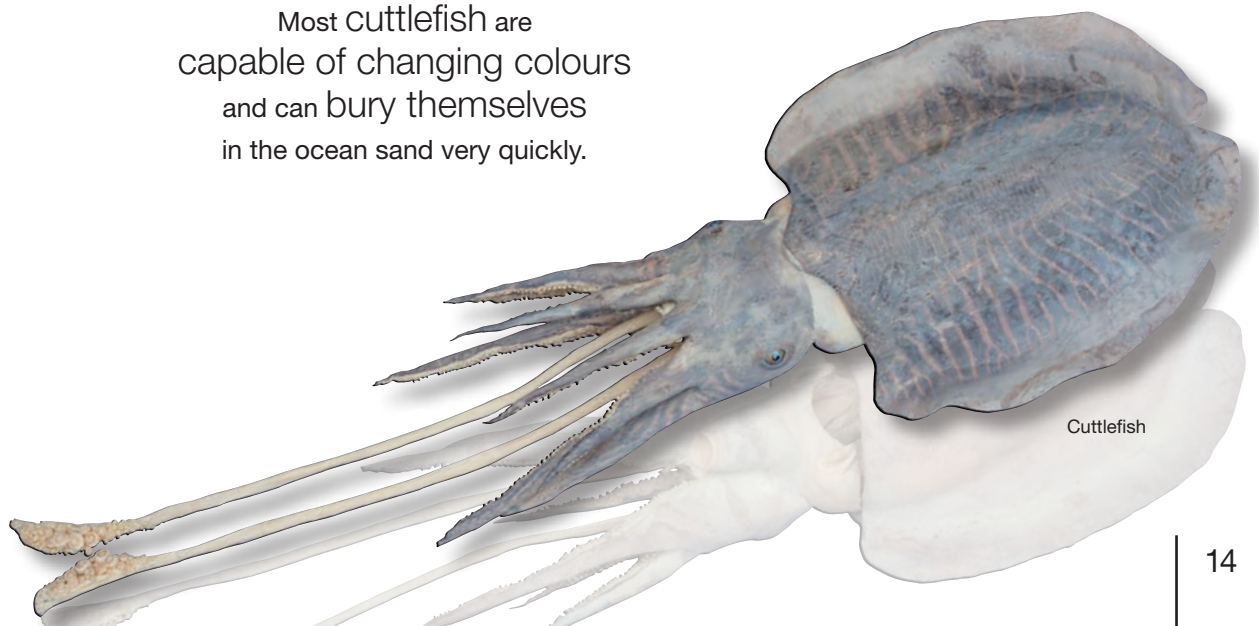
Sharks
have been swimming the seas
for 400 million years—
that's longer than the
dinosaurs walked the Earth.

Sea scallops
grow rapidly during the early years of life.
Between the ages of 3 and 5, they commonly increase
50% to 80% in shell height
and quadruple their meat weight.

The maximum speed of a snail
is 100 metres per hour.

Mackerel,
unlike any other species, are likely to die if their
incredibly thin and specialized skin is
touched by human hands. It is theorized that this
might be due to the oils in human hands.

Most cuttlefish are
capable of changing colours
and can bury themselves
in the ocean sand very quickly.



Cuttlefish

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Frogs don't need to drink the way humans do—they absorb water through their permeable skin!

Giraffes are the tallest mammals on Earth, ranging in height from 4.3 to 5.5 metres. An adult bull giraffe can feed on the leaves of trees over 5.8 metres above the ground!

Mallards can travel up to 105 kilometres per hour.

The combination of the cat's inner ear (vestibular apparatus) and tail gives the cat its incredible balance and acrobatic prowess.

Caribou have long, coarse hair with hollow cores, which keeps them insulated in colder climates. Caribou are very strong swimmers and can travel across wide, rapid and frigid rivers.

A bull's heart is around 5 times heavier than a human heart.



Caribou

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