# CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning your visit</td>
<td>3</td>
</tr>
<tr>
<td>Frequently asked questions</td>
<td>4</td>
</tr>
<tr>
<td>Q&amp;A with kids</td>
<td>6</td>
</tr>
<tr>
<td>What is plastination</td>
<td>8</td>
</tr>
<tr>
<td>WELCOME—a letter from BODY WORLDS</td>
<td>10</td>
</tr>
</tbody>
</table>

## EXHIBITION OVERVIEW

<table>
<thead>
<tr>
<th>System</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Locomotive System</td>
<td>12</td>
</tr>
<tr>
<td>The Nervous System</td>
<td>13</td>
</tr>
<tr>
<td>The Respiratory System</td>
<td>14</td>
</tr>
<tr>
<td>The Cardiovascular System</td>
<td>15</td>
</tr>
<tr>
<td>The Digestive System</td>
<td>16</td>
</tr>
<tr>
<td>Embryonic &amp; Fetal Development</td>
<td>17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussion questions</td>
<td>18</td>
</tr>
<tr>
<td>Additional resources</td>
<td>20</td>
</tr>
</tbody>
</table>

This material is protected under copyright laws and may not be reproduced in any manner without the express written permission of the Institute for Plastination.
PLANNING YOUR VISIT

BEFORE

- Read the note to parents and frequently asked questions in this family guide.
- Visit the BODY WORLDS website: www.bodyworlds.com.
- Discuss the visit with your family and explain what they are going to see and why.

DURING

- Consult this Family Guide for an overview of the exhibit.
- Seek out the museum staff for answers to your questions about the exhibition.

AFTER

- Discuss the experience with your family using some of the discussion questions included in this guide as prompts.
- Visit some of the websites listed in the additional resources section.
FREQUENTLY ASKED QUESTIONS

What is BODY WORLDS?
The BODY WORLDS exhibitions are first-of-their-kind exhibitions through which visitors learn about anatomy, physiology, and health by viewing real human bodies, preserved using an extraordinary process called plastination: a groundbreaking method for specimen preservation invented by Dr. von Hagens in 1977.

Each exhibition features more than 100 real human specimens, including whole-body plastinates, individual organs, blood vessel configurations and transparent body slices. The specimens on display stem from a unique body donation program established in Heidelberg, Germany and managed by the Institute for Plastination. The exhibitions also allow visitors to see and better understand the long-term impact of diseases, the effects of tobacco consumption and the mechanics of artificial supports. To date, more than 50 million people around the world have viewed the BODY WORLDS exhibits.

What is the purpose of the exhibition?
The BODY WORLDS exhibitions aim to educate the public about the inner workings of the human body and show the effects of poor health, good health and lifestyle choices. They are also meant to create interest in and increase knowledge of anatomy and physiology among the public.

Couldn’t I learn just as much from books or models of human anatomy?
Real human bodies show the details of disease and anatomy that cannot be shown with models. They also allow us to understand how each body has its own unique features, even on the inside. Visitors are drawn to real specimens in a way that they are not to plastic models. One of the special features of museums and science centers is that they offer people a chance to see the real thing in a safe and informative environment.

What is plastination?
Invented by scientist and anatomist Dr. Gunther von Hagens in 1977, plastination is the groundbreaking method of halting decomposition and preserving anatomical specimens for scientific and medical education. Plastination is the process of extracting all bodily fluids and soluble fat from specimens, replacing them through vacuum forced impregnation with reactive resins and elastomers, and then curing them with light, heat, or certain gases, which give the specimens rigidity and permanence.
Where did the specimens on display come from? Will we know who the plastinates are or how they died?
The BODY WORLDS exhibitions rely on the generosity of body donors; individuals who bequeathed that, upon their death, their bodies could be used for educational purposes in the exhibitions. Currently, the Institute for Plastination has a donor roster of more than 18,000 individuals, 2,200 of which are already deceased. All of the whole body plastinates and the majority of the specimens are from these body donors; some specific specimens that show unusual conditions come from old anatomical collections and morphological institutes. As agreed upon by the body donors, their identities and causes of death are not provided. The exhibition is focused on the nature of our bodies, not on providing personal information.

Why are the plastinates posed the way they are?
The poses of the plastinates have been carefully thought out and serve educational aims. Each plastinate is posed to illustrate different anatomical features. For instance, the athletic poses illustrate the use of muscle systems while playing sports. The poses allow the visitor to relate the plastinate to his or her own body.

Will I be able to touch any of the plastinates?
While you will be able to get very close to the plastinates, as a rule, visitors are not allowed to touch them.

Are these exhibitions appropriate for children?
More than 50 million people, including young children, have viewed the BODY WORLDS exhibitions around the world. It is important to note that the exhibition includes full-body plastinates with exposed genitals.

Why is it important for the public to see these exhibits?
We believe that when people understand more about how the body works and how it can break down, they are more likely to choose healthy and sustainable lifestyles. We also hope it will inspire visitors to learn more about the life sciences. Knowledge about what the human body looks like and how it functions is basic life science information that should be available to everyone.

How long can I stay inside the exhibits?
You can stay as long as you like, but we recommend allowing yourself about one to two hours. The length of time will vary on how long each visitor wishes to examine each specimen and read the information provided.

Are food and drink permitted in BODY WORLDS?
Food and drink are not permitted in the exhibit galleries. This policy helps to protect the BODY WORLDS plastinates.
**Q&A WITH KIDS**

Children Visiting BODY WORLDS—Interview with Dr. Gunther von Hagens, Creator of BODY WORLDS & Inventor of Plastination

Were you ever scared to work with dead bodies?

Dr. von Hagens: When I was about six years old, I was very sick and nearly died. I was in hospital for many months and became very comfortable in that environment of the sick and dying. The doctors and nurses who cared for me became my heroes and I wanted to be like them. Later, when I worked in a hospital as an orderly and then a nurse, (long before I became a doctor), one of my duties was to transport the dead to the morgue. Other workers didn’t like this job because it frightened them, but I was never afraid. Being afraid of death is not a good way to live.

Were the people in the exhibit old when they died?

Dr. von Hagens: The people who donated their bodies for plastination and to educate all of us about health are of various ages. Some were old, but others were young in the prime of their life. Each person is different, not just on the outside but also on the inside. Even after more than 40 years as an anatomist, I have never seen two hearts that look the same.

Where did the idea for BODY WORLDS come from?

Dr. von Hagens: When I used to teach anatomy to students in medical school in the 1970s, I had to use illustrated anatomy atlases and picture books to show the organs and body systems. I tried to use real human organs and specimens, but at that time the specimens were preserved in blocks of plastic so you could not touch them or study the placement of the organs properly. I realized one day that if the plastic was inside the body and not outside it, the specimen would be rigid and easy to grasp, and study and work with. I was only trying to solve a problem; I wanted to educate my students so they would become better doctors, as I don’t think doctors should be poking around inside your body and operating on you if they don’t know important things about it.
But something very unusual began to happen after I began to plastinate organs and specimens. The janitors and secretaries and office workers at the university began to stop by the lab; they were fascinated by the plastinates. This was when I began to think of anatomy for lay people, which is what BODY WORLDS is. It is very different from anatomy for medical professionals because it has to be interesting and dynamic and not scary to look at.

**How long does it take to prepare the bodies for display?**

Dr. von Hagens: Plastination takes a very long time. A whole body can take up to 1,500 hours to prepare. The specimen which has to date taken the longest to produce is a plastinated elephant that weighs 3.2 tons and took three years to complete.

**What happens to the skin once it is removed from the bodies?**

Dr. von Hagens: Each body is an anatomical treasure, human remains must be handled carefully and respectfully. All human remains are cremated and buried.

**How do you get people to donate their bodies?**

Dr. von Hagens: I have never recruited body donors. People offer their bodies for plastination for several reasons: they want to leave a legacy for future generations; they don’t like the effects of decay and decomposition that take place after death; or they don’t like traditional burials.
Preservation by Plastination

Plastination is a method that was developed to preserve the body and to use it for educational purposes. Like most inventions, the basic principle is relatively simple.

1. Embalming and Anatomical Dissection

The first step of the process involves halting decay by pumping formalin into the body through the arteries. Formalin kills all bacteria and chemically stops the decay of tissue. Using dissection tools, the skin, fatty and connective tissues are removed in order to prepare the individual anatomical structures.

The plastination process itself is based on two exchange steps:

2. Removal of Body Fat and Water

In the first step, the body water and soluble fats are dissolved from the body by placing it into a solvent bath (e.g., an acetone bath).
3. **Forced Impregnation**

This second exchange process is the central step in plastination. During forced impregnation a reactive polymer, e.g., silicone rubber, replaces the acetone. To achieve this, the specimen is immersed in a polymer solution and placed in vacuum chamber. The vacuum removes the acetone from the specimen and helps the polymer to penetrate every last cell.

4. **Positioning**

After vacuum impregnation, the body is positioned as desired. Every single anatomical structure is properly aligned and fixed with the help of wires, needles, clamps, and foam blocks.

5. **Curing (Hardening)**

In the final step, the specimen is hardened. Depending on the polymer used, this is done with gas, light, or heat.

Dissection and plastination of an entire body requires about 1,500 working hours and normally takes about one year to complete.

**Slice Plastination**

Slice plastination is a special form of plastination. First, the body is frozen and cut into 2–8 mm-thick slices. Instead of silicone, the body is treated with polyester or epoxy resin during this process.

*Courtesy of The Denver Post*
WELCOME
A LETTER FROM BODY WORLDS

Dear Families,

BODY WORLDS is an incredible exhibition offering the unique opportunity to see and understand our own anatomy and health and to gain a new appreciation and respect for what it means to be human. The exhibition features a unique collection of authentic human specimens—including whole bodies, individual organs, and transparent body slices. Plastination is a process that replaces the natural fluids in the body with a type of flexible plastic. This allows the bodies to be fixed into lifelike poses that illustrate how our bodies are structured and how they function when performing everyday activities. The use of plastic for preservation also means that the specimens are odorless and completely dry.

This exhibition shows how the body works when it is healthy and what happens when it breaks down. Visitors will see how lifestyle choices may affect the body. You can see the effects of smoking on the lungs and how artificial joints in knees and hips fit into a human skeleton.

Important information to know:
BODY WORLDS relies on the generosity of body donors; individuals who, prior to their death, bequeathed their bodies for educational purposes. Before the North American premiere of BODY WORLDS, an independent ethics review was conducted by a distinguished committee of theologians, ethicists, academics and medical luminaries. The plastinated specimens are without skin so that visitors can see the bones, muscles, tendons, nerves, blood vessels and organs. A section of the exhibition highlights prenatal development.

To sum up
Gunther von Hagens’ BODY WORLDS is an exceptional exhibition and we believe it will give people a unique opportunity to better understand their own bodies. For further information, we suggest that you consult our website www.bodyworlds.com.

Dr. Angelina Whalley
Conceptual Designer of BODY WORLDS and President and CEO of the Institute for Plastination
EXHIBITION OVERVIEW
INCLUDING FAMILY FUN FACTS

Gunther von Hagens’ BODY WORLDS exhibits use the science of plastination to let visitors see how human bodies are put together. The exhibit also teaches how different anatomical systems work in the human body. This special supplement explores several of the systems featured in the exhibit, including the locomotive system, the nervous system, the respiratory system, the cardiovascular system, the digestive system, and embryonic & fetal development.
THE LOCOMOTIVE SYSTEM
Makes motion happen

The human body is composed of various organ systems working together in an orderly fashion to form a unified whole and to perform the functions of life.

The body’s movements, including both stationary and forward motion, constitute a significant portion of these functions.

Movements are made possible by what is known as the locomotive system which consists of the bones, muscles and joints.

COOL FACT
At birth, humans have 300 bones. As a baby grows, however, many of the smaller bones fuse together so that adults have just 206 bones.

Learn with BODY WORLDS
Half of all your bones are in your hands and feet. The average person’s muscles do an amount of daily work equivalent to loading 24,000 pounds onto a 14 ft. high shelf.
THE NERVOUS SYSTEM
The messenger and the boss

All bodily functions are monitored and regulated by an extraordinarily precise network of nerve fibers stretching from head to toe.

These fibers originate directly in either the brain or spinal cord and become increasingly fine as they branch out into the peripheral regions of the body.

Neurons and their axons are the building blocks of the nervous system. These cells constitute the body’s communication system, generating and transmitting weak electrical signals.

The number and sequence of these signals transfer information from one region of the body to another.

Learn with BODY WORLDS

Your brain, many times more complex than the best computer, operates on the amount of electric power that would light a 10-watt bulb. The brain weighs about three pounds—1/50 of the total average adult weight. The brain is an oxygen eater. The brain uses 1/4 of the oxygen you take in.
THE RESPIRATORY SYSTEM

Oxygen in, carbon dioxide out

Human life requires a continuous supply of oxygen which we extract from the air.

Without this element, most of the body’s cells would not be able to survive more than a few minutes.

Oxygen is indispensable for cell metabolism, a process that transforms nutrients into energy to keep the body functioning.

COOL FACT

Every minute you breathe in one quart of air. When you are doing physical activity this number can increase to 15 gallons of air per minute.

Learn with BODY WORLDS

When you sneeze you can produce wind speeds as great as those in a hurricane or even a tornado. Lungs are made up of about 600 million spongy bags called alveoli. The total surface area of the lungs is about the same size as a tennis court. Lungs are the only organ in the body light enough to float on water.
THE CARDIOVASCULAR SYSTEM
The body’s great pump

This is an organism’s major transport system. Not only does the circulatory system distribute nutrients, oxygen and hormones to individual regions of the body; it also collects metabolic by-products which are then eliminated.

The heart is the engine of this system, and the dense network of blood vessels form the transport routes.

COOL FACT
At every stage of life, your heart is about the size of the fist you make when you close your hand.

Learn with BODY WORLDS
If all the vessels of this network were laid end to end, they would extend about 60,000 miles, far enough to circle Earth more than twice. The heart circulates the body’s blood more than 1,000 times a day.
All of the organs of the human body require an uninterrupted supply of energy if they are to perform their functions properly.

Once they have been processed chemically, the nutrients present in food and absorbed through the digestive tract provide the organism with the energy that it requires.

The organs of the digestive tract break down food both mechanically and chemically in a way that allows the nutrients to pass into the blood, where they can be transported to each individual cell.

**COOL FACT**

The whole process of digestion takes about 72 hours from end to end.

**Learn with BODY WORLDS**

Chewing food takes from 5-30 seconds. It takes 3 hours for food to move through the intestine. In your lifetime, your digestive system may handle about 50 tons of food.
Life begins with a single cell, or zygote, after the father’s sperm fertilizes the mother’s egg.

Roughly 30 hours after fertilization, a microscopic human egg begins to divide into two identical daughter cells. Twins will develop if these two cells separate from each other. Most of the time, however, the complete embryo will remain intact and migrate down the Fallopian tube, settling in the uterus on the sixth day. Pregnancy will last an average of 260 days from that point.

The embryo, suspended in amniotic fluid and surrounded by fetal membranes, is linked to the maternal blood supply via the umbilical cord and placenta. During the first four weeks, the embryo is roughly 0.15 inches long and will grow to 1.2 inches by the end of the eighth week, when it will weigh approximately 0.1 ounce. All of the organs will be in place by the end of this period, after which the developing child is referred to as a fetus. The length and weight of the fetus then begins to increase significantly as it proceeds through further complex stages of development.

FACT

When a pregnant woman consumes alcohol, the alcohol level in the blood of her fetus will be the same as in her own.

Learn with BODY WORLDS

Many factors influence the development of an unborn baby. How do environmental influences affect the child? What circumstances in the life of the mother have a positive or negative effect, or can even harm the baby? How do these influences actually reach the fetus?
POST-VISIT DISCUSSION QUESTIONS

Talk about the exhibition with your family.

Allow them to respond and voice their opinions, and share your opinions with them.

What effect did the exhibition have on you?

What did you learn about your own body from seeing this exhibition?

What can you do as an individual and as a family to best take care of your health?

What did you like about the exhibition? Not like?

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________
What about the exhibition was most surprising to you?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Which features of the plastinates looked most authentic?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

How would you describe the behavior of other people looking at the plastinates?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
ADDITIONAL RESOURCES

National Institutes of Health—The Visible Human Project

Centers for Disease Control and Prevention
https://www.cdc.gov/

US Department of Agriculture Choose My Plate.gov Games:
https://www.choosemyplate.gov/games

Kids Health Organization
http://kidshealth.org/