HUMAN BODY GALLERY

GRADES 3–8

Human Body Gallery at the Science Museum

- Field Trip Guide
- Classroom and Museum Activities
- Connections to Minnesota Academic Standards

Science Museum of Minnesota®

In this guide

Explore human development and biology in the Human Body Gallery on Level 4 by inviting students to think like scientists by making observations about the human body and using scientific tools.

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How to use this guide

- Student activities in this guide can be done in any order. You can pick and choose only the items that work best for your students.
- Print off the student activities you choose from pages 12–14. Consider adding your own pages and activities.
- Encourage your students and chaperones to think like scientists by practicing observation in the museum.
- Prior to your visit, be sure to give chaperones a copy of the Chaperone Guide on pages 10-11. These pages are full of ideas & questions to help them as they encourage students in making scientific observations.
- Prepare your students for their museum visit by introducing the schedule of the day and behavior expectations. You will find several resources at smm.org/fieldtrips.
- Pencils are welcome at the Science Museum of Minnesota! The worksheets provided have plenty of writing space and be easily tucked into pockets when necessary.

CLEAN WATER LAND & LEGACY AMENDMENT

Gallery features

The exhibits on Level 4 focus on the science of the human body––how it works, and how scientists have come to know how it works. More specifically...

Wonder Years explores the science of early childhood development––both how the brain develops over time and how science has led us to those conclusions. Students will try out behavior and brain experiments on themselves and one another, just like scientists.

The Human Body Gallery explores human organ systems, from bones to guts, skin to brains, and the many different techniques your body has to keep you healthy. This gallery includes several specimens of actual human tissue and now houses the Egyptian mummy, which is displayed in its own alcove. In the Chaperone Guide, please see the paragraph titled, "Is this real?" for tips on how chaperones can discuss sensitive human specimen issues with students.

Weighing the Evidence: Questionable medical devices from the past 200 years challenge you to probe modern and historic healthcare claims by testing devices from the past and present and uncovering surprising facts. Practice separating reliable from dubious information, by learning to use techniques that improve your ability to make science-based healthcare decisions.
Note: Some of these devices may not be considered a scientific tool or instrument, as mentioned in the museum activity on page 14. Ask students to provide evidence that it provides a solution, or does what it claims to do.

Pre-visit activities

What do human body scientists so? Ask your students to think about what scientists of the human body actually do. As a group, make a list of any and all professionals who study about or work with the biological functions of the human body.

Here is a list of human biology topics to get you started:

Anatomy	the study of the structure of living things
Anesthesiology	the study/treatment of pain and consciousness during medical procedures
Behavioral Science	the study of why animals (including humans) do what they do
Biochemistry	the study of the chemical compounds and processes occurring in organisms
Biomechanics	the study of the structure and function of living systems
Bionomics	the study of an organism and its relation to its environment
Biophysics	the study of how matter, motion, and energy interact within living things
Cardiology	the study/treatment of the heart
Cell Biology and Histology	the study of cells––the very small units of matter that make up living things
Dentistry	the study and treatment of teeth
Dermatology	the study/treatment of the skin
Embryology	the study of living things before they are born
Evolution	the change in inherited characteristics of living things over generations
Gastroenterology	the study/treatment of the digestive system
Hematology	the study/treatment of the blood
Genetics	the study of DNA and how living things receive traits from generations before them
Gerontology	the study of what happens when you age and the treatment of older people
Gynecology	the study of the female reproductive system
Immunology	the study of the immune system, including allergic reactions
Medicine	the study of health and treatment of illnesses
Microbiology	the study of living things that are smaller than the eye can see––including the kind that can make you sick
Nephrology	the study/treatment of the kidneys
Neurology	the study/treatment of the brain
Obstetrics	the study of pregnancy and childbirth
Oncology	the study/treatment of cancer
Opthamology	the study/treatment of the eyes
Orthopaedics	the study/treatment of the bones and skeletal system
Otolaryngology	the study/treatment of the head, neck, ears, nose, and throat
Pathology	the study/treatment of changes in body tissue that may cause disease
Podiatry	the study/treatment of the foot
Pediatrics	the study of childhood health and the treatment of children
Physiology	the study of the function of living systems
Psychiatrist	the study/treatment of mental health
Pulmonary Medicine	the study/treatment of diseases of the lungs and respiratory system
Urologist	the study of the male and female urinary tract and the male reproductive system
Virology	the study of viruses

Pre-visit activities

Ask your students to select a scientist from your class list. Have them draw, collage, journal, or make an idea map about that scientist's day–to–day life. Prompts may include:

- What areas of expertise might your scientist have?
- Why might that scientist have become interested in their work?
- What things might they need to know in order to do their work?
- How do we know if a scientist has done his/her job?
- What tools do they use?
- What does their work space look like?

Think like a scientist: In order to do their work, biologists must (1) ask questions, (2) apply knowledge and observation to those questions, and (3) design experiments. Have your students design two or more pages in a lab notebook, complete with whatever charts, sketches, thought doodles, and notes that might help them think, if they were a career scientist. Somewhere in the pages, they should include the answers to these questions:

1. What is a question you have about the human body?
2. What could you observe at the museum to help answer your question?
3. How might you design a test to help you answer your question?

Brain development: Make a wall chart of things that younger kids can do vs. things kids their age can do. Do they remember when they learned to do the things they can do? Have your students brainstorm questions they have about the brains of young children.

Systems: We know that each organ in our body has a function––often more than one. But how does it connect to other organs? Assign groups of students to represent an organ in the body. Have each group make a list of the duties their organ carries out. (For younger students, you can provide the list, and have them work out a way to act out the actions listed.) Then ask the groups to join forces. What does one need to do its job? How does each organ help other organs? By the end of this activity, students should have created a system, having linked their organs using physical action, drawing, or building.

Follow–up questions: How do we know if this system is working? How do we know if it's not working? What type of work is the system doing? What materials does the system need to do its work? What materials are left after the work is done?

Teachers of grades 7 and 8 may consider including some larger questions to discuss:

- What is science?
- If scientists are people who "do science," what does that look like?
- Here are two different definitions of science. Which do you like better? Why?
  - "Science is the study of the natural world…and the…application of facts, principles, concepts, or conventions associated with these principles." –National Research Council (NRC)
  - "Science is a people's way of coming to know the natural world and the knowledge and understanding that result." –Science House team, Science Museum of Minnesota

Post-visit activities

Chaperone check-in: This packet provided your chaperones with an observation sheet in which they were encouraged to refect on what they saw/heard students doing/saying during their museum visit. Ask chaperones about their observations or collect their sheets to get an idea as to what was on students' minds as they moved through the exhibits, and what they might be interested in discussing as a class or in small groups.

Students as scientists: (See "Think Like a Scientist" in Pre–Visit Activities section.) Ask your students to think about everything they saw in the gallery... Then have t hem reflect on these questions:

- What do you wish you could have discovered about the human body?
- What would you choose to study next?
  - Are you most interested in organs? Cells?
  - How microorganisms (viruses and bacteria) affect the body? How humans think?
  - How humans interact with the world around them?
  - What question would you like to answer?
- How would you go about studying that topic? What tools would you need? What methods would you use?
- Can you think of things in the exhibits that did not seem "scientifically" reliable? What further testing might be necessary? (NOTE to teacher: Devices in the Weighing the Evidence section have not provided scientifically valid evidence for their claims.)

It's... SUPER CELL! Decide if you want your students to pick a cell, organ, or other body part from the gallery to become a superhero... or even a super villain...? Have them design a comic book about the adventures and heroics of their character inside the human body.

System song: Interconnected cells make up interconnected organs that make up interconnected tissues and organ systems. Have your students consider the question: What is a good metaphor for the way systems work in the human body? Then have them create a poem, song, or other piece of art to express this metaphor to someone who has never been to the Human Body Gallery.

What else? Have your students think about the Human Body Gallery, and decide on at least one thing they would have liked to learn more about.
Then... Have them write a letter to the Science Museum staff explaining what else they would like to learn about the human body and why.

Design an exhibit: Have them design a new piece of the Human Body Gallery exhibit. Things to consider: Will people your age like this part of the exhibit? Will they learn from it? What about kids younger than you?

Post-visit activities

Talk to a scientist: Returning to the ideas in the "Think Like a Scientist" pre–visit activity and "Students as Scientists" above, have your students think about scientists in their community. If they could speak with a scientist, what type of scientist would they want to talk to? What would they ask? How would they go about finding a scientist (hint: universities and research facilities)? As an ongoing project, you might assist students in contacting a scientist to interview him/her about his/her work, background, and other interests.

Science and emotion: Science is a human endeavor, and humans have emotions. In fact, this is a scientific study in itself. Your students probably experienced emotions on their visit today.
Hold a classroom discussion about emotions they felt in the exhibits gallery. What did they like/dislike? Did they have any confusion, questions, discomfort?
Have students write their feelings on comment cards, then place all of the comment cards in a hat. Careful not to betray the feelings of any students who don't volunteer their own comments, draw comments from the hat to discuss as a group. Do any new conundrums present themselves? Any solutions?

Ask students to write about or discuss:

Best (or Worst) Science Museum Thing! Think about the best thing you saw in the Human Body Gallery.
...Or maybe the worst?

- What stood out to you?
- What did you like/dislike about it? Why?
- Why was it in the museum?
- What questions do you have about it?

Have students create a fun reflection about their visit to the Human Body Gallery.

- a cartoon of them in the museum
- a "scientific" diagram labeling parts
- a review by a TV reporter about the Human Body Gallery
- a song or rap (performance optional)

Minnesota Academic Standards–Science

The Science Museum of Minnesota provides a field trip destination that allows teachers and students to reinforce Minnesota Academic Standards. Use of the materials in this Educator Guide will help you link learning experiences to the following content standards.

3rd Grade

Nature of science and engineering

3.1.1.1.1 Provide evidence to support claims, other than saying "Everyone knows that," or "I just know," and question such reasons when given by others.

3.1.1.2.1 Generate questions that can be answered when scientific knowledge is combined with knowledge gained from one's own observations or investigations. For example: Investigate the sounds produced by striking various objects.

3.1.1.2.3 Maintain a record of observations, procedures and explanations, being careful to distinguish between actual observations and ideas about what was observed. For example: Make a chart comparing observations about the structures of plants and animals.

3.1.3.4.1 Use tools, including rulers, thermometers, magnifiers and simple balance, to improve observations and keep a record of the observations made.

Life Science

3.4.1.1.1 Compare how the different structures of plants and animals serve various functions of growth, survival and reproduction. For example: Skeletons in animals and stems in plants provide strength and stability.

4th Grade

Life science

4.4.4.2.1 Recognize that the body has defense systems against germs, including tears, saliva, skin, and blood.

5th Grade

Nature of science of engineering

5.1.3.4.1 Use appropriate tools and techniques in gathering, analyzing and interpreting data. For example: Spring scale, metric measurements, tables, mean/median/range, spreadsheets, and appropriate graphs

6th Grade

Nature of science and engineering

6.1.3.1.1 Describe a system in terms of its subsystems and parts, as well as its inputs, processes and outputs.

7th Grade

Nature of science and engineering

7.1.1.1.1 Understand that prior expectations can create bias when conducting scientific investigations. For example: Students often continue to think that air is not matter, even though they have contrary evidence from investigations.

7.1.1.2.1 Generate and refine a variety of scientific questions and match them with appropriate methods of investigation, such as field studies, controlled experiments, review of existing work, and development of models.

7.1.1.2.4 Evaluate explanations proposed by others by examining and comparing evidence, identifying faulty reasoning, and suggesting alternative explanations.

Life Science

7.4.1.1.1 Recognize that all cells do not look alike and that specialized cells in multicellular organisms are organized into tissues and organs that perform specialized functions. For example: Nerve cells and skin cells do not look the same because they are part of different organs and have different functions.

7.4.1.1.2 Describe how the organs in the respiratory, circulatory, digestive, nervous, skin and urinary systems interact to serve the needs of vertebrate organisms.

7.4.1.2.1 Recognize that cells carry out life functions, and that these functions are carried out in a similar way in all organisms, including, animals, plants, fungi, bacteria and protists.

7.4.4.2.1 Explain how viruses, bacteria, fungi and parasites may infect the human body and interfere with normal body functions.

7.4.4.2.2 Recognize that a microorganism can cause specific diseases and that there are a variety of medicines available that can be used to combat a given microorganism.

8th Grade

Nature of science and engineering

8.1.1.1.1 Evaluate the reasoning in arguments in which fact and opinion are intermingled or when conclusions do not follow logically from the evidence given.

8.1.1.2.1 Use logical reasoning and imagination to develop descriptions, explanations, predictions and models based on evidence.

Additional Resources

Books

Uncover the Human Body, Luann Colombo & Jennifer Fairman, Silver Dolphin Press, 2003. ISBN: 978–1–5714–5789–9. (Grades 3-5)

Human Body: A Book With Guts, Dan Green & Simon Basher, Kingfisher Publishing, 2011. ISBN: 978–0–7534–6501–1. (Grades 6-8)

The Brain: Our Nervous System, Seymour Simon, Harper Collins Publishing, 2006. ISBN: 978–0–0608–7719–4. (Grades 3-4)

The Human Body for Every Kid: Easy Activities That Make Science Learning Fun, Janice VanCleave, Jossey–Bass Publishing, 1995. ISBN: 978–0–4710–2408–8. (Grades 5-7)

Head to Toe Science, Jim Wiese, Wiley Publishing, 2000. ISBN: 978–0–4713–3203–9. (Grades 3-5)

Websites

smm.org/educators/standards/humanbodygallery
Searchable standards database for specific links to Human Body Gallery exhibits.

smm.org/visit/humanbody
Further descriptions of several exhibits in the Human Body Gallery.

bioedonline.org
Offers many biology resources for educators and parents including news, lesson plans, videos, and digital slides.

faculty.washington.edu/chudler/dev.html
Quick cheat–sheet on the basics of brain development

learn.genetics.utah.edu/
teach.genetics.utah.edu/
A nationally and internationally–recognized education program that translates science and health for non–experts

dnalc.org
Elementary and middle–school appropriate activities, websites, and other activities exploring genetics and genetic disease

medmyst.rice.edu
Medical “mystery–solving” computer game for middle schoolers

Art & other connections, 7–8th Grade

- Short Story: “Flowers for Algernon” by Daniel Keys – explores the emotional life of a scientific experimental subject who experiences an increase in intelligence… then gradually loses it again.
- Visual art inspired by human anatomy (requires teacher to preview and filter): streetanatomy.com
- Video: TED talk on how babies learn language: ted.com/talks/patricia_kuhl_the_linguistic_genius_of_babies

Chaperone Guide

Tips:

- Don't worry about reading or understanding all of the exhibit messages. Share in and create excitement in students by encouraging them to make observations about what they see and hear.
- Ask open–ended questions to help students think like scientists! These questions have no specific answer and allow students to interpret what they observe. Open–ended questions can include...
  - Can you tell me more about that?
  - What else did you notice/see/hear/feel?
  - How do you know that? What did you observe?
  - Can you think of something that is similar to this?
  - What have you tried so far?
- Museum staff and volunteers are located throughout the museum wearing blue. They enjoy speaking with visitors and are happy to answer questions.
- Encourage students to work in teams. When you hear them asking each other questions, try to record some of those ideas on this page. Teachers and students can use this information to ask further questions and do more research when they get back to school. What questions are you hearing from students? What are they talking about?

Getting around the Human Body Gallery:

You will find a few general areas within this gallery.

Wonder Years: Explore brain development in early childhood and the techniques scientists use when studying it.

Human Body Components: Discover the workings of your heart, compare the different tissues that make up your body, see real organ, tissue, and cell samples, and explore smaller worlds by using a microscope.

Demonstration Station: Knowledgeable volunteers are on hand to present and discuss more about the human body, using models, video, tissue samples, and other features. (Please note, the demonstration station is not always staffed.)

Weighing the Evidence: Questionable medical devices provide claims for cures or health enhancements with no scientific evidence. Improve your ability to make science-based healthcare decisions.

"Is this real?"

As you travel around, students will likely ask you if the body parts they see are "real"––as in, "Did they come from a real human body?" In the majority of cases, the answer is yes. Preservation methods for these tissues varies.

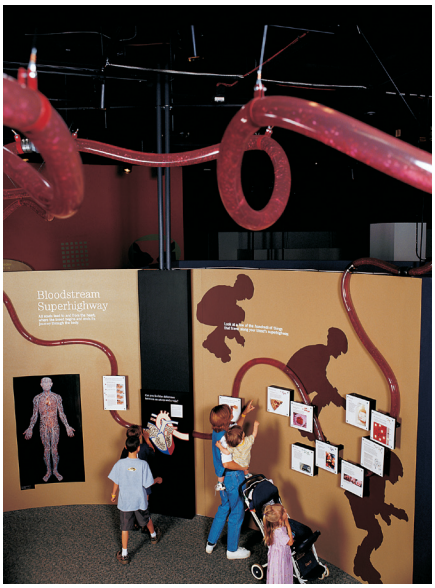
All of our organ samples came from people who chose to legally donate their body for scientific study, just as some people choose to become organ donors. These samples have been preserved via a process called plastination, which replaces all fats and water with silicone, preventing decay and allowing bodily tissues to remain intact.

Our Egyptian mummy is also real and was donated to the museum in 1925. It was preserved in Egypt in a very different way, using post–mortem surgery, natron, a drying salt mixture, and special herbs and oils.

Your name: _____

Student Activities

Find a part of the human body you see in the gallery.
Draw a picture or write its name down here:



What's a *different* part of the body you can see in the gallery? Draw or write it here:

Make a chart comparing the two parts of the body above. What do they do? How are they the same/different?
– OR –
Write a conversation the two parts of the body might have with one another.
How are they are they similar? Different? What's their relationship with each other? Their relationship to the rest of the body?

Your name: _____

Find an organ or cell in the Human Body Gallery—An organ is made up of several kinds of tissues that work together. Humans have more than 70, including the brain, heart, lungs, skin, and more!

What cell or organ did you choose? Can you think of something outside of the human body that has a similar **structure?** Draw or write about it here.

Can you think of something outside the human body that has a similar **purpose?**

Your name: _____

Challenge: Find the Tools. Find three scientific tools/instruments in the exhibits on this floor. Draw a picture of them in use or list them here:

1. _____

2. _____

3. _____

Now, pick one tool to advertise. By drawing or writing, give your tool...
a snappy nickname / a catchy theme song / a cool design / an unforgettable slogan / all of the above!
Don't forget to include...

- What your tool does
- Who can use it
- Cool features
- What it helps us learn

Find a tool, instrument or device that is just plain weird and no one has evidence that it does what it claims to do. Write the name and describe or draw it here: