Q?rius Field Trip Guide
School Program: COLLECTIONS CHALLENGE

- Welcome to Q?rius
- Field Trip Logistics
  - Getting the Most from Q?rius
  - Class Overview
- Teaching Resources
- Associated Standards
Welcome to Q?rius, The Coralyn W. Whitney Science Education Center

Welcome to a New Kind of Field Trip

Thank you for choosing Q?rius at the Smithsonian’s National Museum of Natural History as your field trip destination! We think of Q?rius as both a place and an experience. We are excited to offer your students the chance to explore science, nature, and culture in a whole new way while supporting your curriculum needs.

We share your passion for learning! We have designed this Q?rius field trip to stimulate your students’ curiosity and to inspire them to better understand the world and their place in it.

Q?rius is an interactive and experimental learning space that brings the unique assets of the Smithsonian’s National Museum of Natural History – the science, researchers, and collections – out from behind the scenes. We call it Q?rius because it is designed to inspire curiosity in a whole new way in the next generation of scientists and science-minded citizens. It is an exhibit-sized interactive space filled with resources that are available only to your students at the world’s largest natural history museum, including:

• A collection of 6,000 objects – fossils, bones, insects, cultural artifacts, pressed plants, and more – all accessible for investigations, carefully selected to support learning goals connected to curriculum for your specific class experience
• A suite of digital tools, including videos, virtual objects, and references to maximize learning from objects and link objects to core science ideas and the people who study them
• Scientific tools integrated with all school experiences
• Student materials based on scientists’ field books to guide the Q?rius experience

The Q?rius Approach

All classes:
• Feature the work and amazing discoveries of Smithsonian scientists
• Link real-world research of Smithsonian scientists to curriculum standards for a unique approach to inspiring your students
• Use inquiry-based, team-oriented approaches to key questions similar to those addressed by Smithsonian scientists
• Reflect the input of teens and teachers with whom we partnered so that we could guarantee program appeal for students and relevance for teachers
• Integrate collections objects, data, scientific equipment, and digital assets to investigate core ideas

Questions? Please feel free to contact us at (202) 633-4039 or NMNHSchoolPrograms@si.edu.

naturalhistory.si.edu/schoolprograms
# FIELD TRIP LOGISTICS

We look forward to your visit to Q?rius. The logistical information provided below will help you prepare for your visit and ensure a smooth arrival. *(Please see page 7 for information on introducing your students to field trip content.)*

## GETTING READY

- Carefully review your confirmation letter. To make any changes to your reservation, e-mail us at NMNHSchoolPrograms@si.edu or call us at (202) 633-4039. Or, visit https://naturalhistory.si.edu/education/school-programs/programs-school-groups-calendar, click on the “Wait List” button for the event you registered for, and select “Overwrite Previous Response if you have already registered for this event” on the registration form.
- Review all information in this packet so that you know what you can expect from your visit. Contact us at NMNHSchoolPrograms@si.edu if you have questions or concerns.
- Prior to arriving at the Museum, **please divide students into no more than 6 teams of 4-6 individuals who will pursue the class investigation together.**
- Arrange for the proper number of chaperones (see below) and distribute the Chaperone Guide to them.

## ARRIVAL AND DEPARTURE

**ADDRESS:** 10th Street NW and Constitution Avenue NW, Washington, D.C. 20013  
**HOURS:** School groups can enter the Museum anytime after 10:00 a.m.  
**ENTRANCES:** The entrance for school groups is at 10th Street and Constitution Ave., NW.  
**CLOSEST METRO STATIONS:** Federal Triangle or Smithsonian on the Blue, Orange or Silver Lines. Archives-Navy on the Green or Yellow Lines.  
**DROP-OFF BUS LANE:** From 9:30 a.m. to 12:00 p.m., Monday-Friday, the curb lane of Constitution Avenue adjacent to the Museum is reserved for school bus drop-off.  
**PICK-UP BUS LANE:** Please board buses on Madison Drive NW (the Museum exit on the Mall side).  
**SECURITY:** For the safety of your students, all bags will be inspected upon entry to the Museum. We encourage students to leave their backpacks/bags on the bus or at school to speed up the entry process. We will contact you before your visit about our express entry option.

## RESTROOMS AND LUNCH

**RESTROOMS:** Restrooms are located near Q?rius on the Ground Floor in the Constitution Avenue Lobby and also on the First Floor, just off the Sant Ocean Hall.  
**LUNCH:** Food is available for purchase at the Atrium Café on the Ground Floor, or the Ocean Terrace Café on the First Floor of the museum. Limited bagged lunch seating is available in the Atrium Café. Bagged lunches must be stowed away at all times while visiting the museum and must only be eaten in the Atrium Café on the Ground Floor. The museum has no refrigerated storage for lunches.

## CHAPERONES

- To guarantee the best learning experience for your students, we require one chaperone for every 10 students in grades 6-8 and one chaperone for every 15 students in grades 9-12.  
- Please share the Chaperone Guide and lesson plans with your chaperones in advance so that they will be fully prepared to accompany and guide students in their learning.

## CANCELLATION POLICY

If you need to cancel your school program(s), please notify us via email at least 72 hours in advance of your program. If you cancel within 24 hours of your visit, or are a no show for your school program, you will not be allowed to book a school program for the remainder of the school year.
GETTING THE MOST FROM Q?RIUS

An Invitation to Experience Science

This School Program will engage your students in an immersive 60-minute program led by an experienced Museum Educator. Students will use objects, data, scientific equipment, and digital assets to investigate core ideas of natural history science and to gain skills in the practices of science. Students will complete a series of activities, document their results, and discuss their conclusions with each other and with the class.

In School: Starting the Experience

- Research shows that students who are oriented to the logistics of a field trip typically learn more from their experience than those who are not. Be sure to discuss schedule, lunch plans, restroom availability, and – most importantly – your expectations for students before arrival.
- Collaboration and communication are central components of science. You can prepare your students for collaboration by assigning them to teams of 4-6 individuals, no more than 6 teams total per program, in advance and asking them to brainstorm ways in which they will work as a team, learn as a team, and achieve consensus.
- Before your visit, review the scientific terms and preparation questions on page 7 with your students to prepare them for the content that will be covered during the program.
- Invite your students to practice their scientific inquiry skills by completing some of our online activities. These activities will introduce them to the types of investigations they will do on their field trip and get them exploring even before they arrive at the Museum!
- Remind students in advance that they will be working with valuable scientific equipment and collections, just like Museum scientists behind the scenes. These are important resources for learning more about the world and our place in it, and we ask that students treat equipment and collections with care and respect, just as our scientists do.

In Q?rius: Behind-the-Scenes Access

- Experienced Museum Educators and volunteers will lead your class. Students will also benefit significantly if their teachers and chaperones actively engage in the program, so please join in, remind them of the directions/instructions provided at each station, and support their learning.
- Just like scientists, students will work together in teams to complete an investigation, using real Museum specimens and sophisticated equipment.
- Equipment and objects are more accessible in Q?rius than anywhere else in the Museum. Students may need gentle reminders to treat objects and equipment carefully while investigating!
- To keep clutter to a minimum, personal items such as backpacks, lunches, and outerwear should be stored away from work tables.
- To protect the specimens, students are not allowed to have any gum or candy in Q?rius.
# School Program: Collections Challenge

## CLASS DESCRIPTION

The Q?rius Collection Zone includes 6,000 natural history objects, all accessible for student exploration in this staff-led program. Working in teams, students will receive a Collections Challenge Card, which assigns them to work in one of the Museum’s departments: Anthropology, Entomology, Invertebrate Zoology, Paleobiology, Mineral Sciences, or Vertebrate Zoology. Like scientists and collections managers at the Museum, students will follow protocols for handling valuable and sometimes delicate objects, and agree upon a strategy to curate and interpret a collection of their own while engaging in the scientific method.

## SUMMARY OF STUDENT EXPERIENCE

Students will be introduced to Q?rius and the Collections Zone, and will review the scientific practices that they will utilize: working as a team, being curious, and exploring answers to questions using the scientific method. Then, students will explore their chosen Q?rius Quandary using collections and a suite of digital tools, including videos, virtual objects, and references, and record their observations on a Data Sheet. Once students have concluded their exploration in the Collections Zone, they will gather together to discuss their experiences and propose hypotheses or research questions based on the observations and questions that arose from their collections. They then can continue their explorations in the exhibit galleries, in the classroom, and online.

## GRADE RANGE

Grades 6-12

## DURATION OF PROGRAM

60 minutes

## Scientist Focus

The Q?rius Collections Challenge gives students first-hand experience with the skills and practices used by Dr. Kristofer Helgen, a zoologist formerly at the National Museum of Natural History. Did you know that we are still finding and naming new mammals around the world? From field expeditions and studying museum specimens, Kris has discovered about 100 mammal species. Wherever they go, our museum scientists and researchers collect specimens: fossils, minerals and rocks, plants and animals, tools and cultural artifacts. Today, the NMNH collections form the largest and most comprehensive natural history collection in the world. By comparing items within the collection, gathered in different eras and regions, scientists learn how our world has varied across time and space. Such collections-based research provides the essential building blocks for answering broader questions about our future. NMNH scientists and their colleagues worldwide seek the puzzle pieces that will form detailed pictures of vital topics such as evolutionary relationships of organisms, biodiversity loss, and global climate change.
Goals & Outcomes

GOAL
Students will use scientific tools, including observation skills, to explore the natural world, develop practices and techniques of scientists, and work in teams to uncover and explore patterns in collections.

LEARNING OBJECTIVES
In this investigation, students will:
• Learn the cyclical nature of the scientific method
• Make close observations of individual collections objects, and across sets of objects
• Construct and articulate hypotheses and/or research questions based on observations of their collections
• Use their observation skills for scientific inquiry and to explore the natural world

STUDENT OUTCOMES
After participating in the Q?rius Collections Challenge, students will be better able to:
• Use their observation skills for scientific inquiry and to explore the natural world
• Understand how looking closely at objects is important for scientific inquiry
• Work in teams to investigate scientific inquiry
• Understand that the process of science is complex and can take multiple paths

Central Questions and Concepts
• What real-world issues are studied by Smithsonian scientists?
• What is the importance of collecting and analyzing data?
• What is the role of curiosity in science?
• Scientists often try to generate multiple explanations for what they observe.
• Scientists look for patterns in their observations and data.
Program Format

ARRIVAL
You can find the entrance to Q?rius in the Constitution Avenue lobby on the Ground Floor of the Museum. If your class begins at 10:15 a.m., please enter the Museum at Constitution Avenue and 10th Street beginning at 10:00 a.m. If you will be exploring the Museum before your Q?rius class, please bring your students to the Constitution Avenue lobby 15 minutes prior to the start of your class. A Museum Educator will meet your group and escort you to a Q?rius classroom. Please do not enter Q?rius on your own.

INTRODUCTION (10 MINUTES)
Students will be introduced to the collections-based research being conducted in the museum and how it fits into the scientific method. They will learn proper techniques for handling objects, just as scientists, researchers, and collection managers at the Museum would. They will familiarize themselves with the tools available and will understand the expectations for their work in Q?rius. Each team will receive a Q?rius Quandary card and Data Sheet to record their observations and questions.

INVESTIGATION (25 MINUTES)
The Collection Zone includes 6,000 objects, all accessible for investigations. Each team’s Q?rius Quandary card, will direct them to work in one of the Museum’s departments: Anthropology, Botany, Entomology, Invertebrate Zoology, Paleobiology, Mineral Sciences, or Vertebrate Zoology. After reviewing their instructions, Museum Educators and volunteer facilitators will serve as guides during the program, managing the time, and assisting the teams of students during their explorations. We invite chaperones and teachers to join in, working with small groups of students during the program. Students will agree upon a strategy to find 4 - 6 objects to start a collection of their own that addresses their quandary. As they gather their collections, students will record any questions that arise from their observations.

USING OBSERVATIONS (10 MINUTES)
After finalizing their collections, the groups will form hypotheses and/or research questions based on their observations and questions that arose during their investigation. Together they will decide on next steps to further research their collections, test their hypotheses and answer their research questions.

DISCUSSION AND CONCLUSION (15 MINUTES)
The Museum Educator will bring the group together to discuss their experiences, collections, observations, discoveries, and how they can pursue further curiosities.
Before Your Visit

GRADES 6-8

**SCIENTIFIC TERMS**
The Collections Challenge will use these terms in the context of natural history scientific exploration. Please review the terms with students before arrival.

<table>
<thead>
<tr>
<th>Biodiversity</th>
<th>Species</th>
<th>Paleobiology</th>
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</thead>
<tbody>
<tr>
<td>Classification</td>
<td>Anthropology</td>
<td>Ornithology</td>
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<tr>
<td>Observation</td>
<td>Zoology</td>
<td>Geology</td>
</tr>
<tr>
<td>Archaeology</td>
<td>Vertebrate</td>
<td>Mineral Science</td>
</tr>
<tr>
<td>Entomology</td>
<td>Invertebrate</td>
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**PREPARATION QUESTIONS**
1. What are the steps of the scientific method?
2. What is the difference between a hypothesis and a theory?
3. What can we learn by comparing and contrasting objects?
4. What resources (people, places, data) do scientists use to conduct their research?

GRADES 9-12

**SCIENTIFIC TERMS**
The Collections Challenge will use these terms in the context of natural history scientific exploration. Please review the terms with students before arrival.

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<tr>
<td>Entomology</td>
<td>Invertebrate</td>
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**PREPARATION QUESTIONS**
1. What is the difference between a hypothesis, a theory, and a law?
2. What is a peer review, and why is it important for scientific work?
3. What information is needed in order to construct an explanation about natural phenomena?
4. What real-world problems affecting today’s society can science address?

**SMITHSONIAN SCIENCE HOW: HOW TO DISCOVER A NEW MAMMAL SPECIES**

**FEATURING DR. KRISTOFER HELGEN**

Prepare students to participate in the Q?rius Collections Challenge by watching featured scientist Kris Helgen’s archived Smithsonian Science How webcast.

[https://naturalhistory.si.edu/education/teaching-resources/life-science/how-discover-new-mammal-species](https://naturalhistory.si.edu/education/teaching-resources/life-science/how-discover-new-mammal-species)

This video features Dr. Kristofer Helgen, a zoologist formerly at the National Museum of Natural History. Did you know that we are still finding and naming new mammals around the world? From field expeditions and museum specimens, Kris has discovered about 100 mammal species. Hear about his surprising find of the “Olinguito” in cloud forests of Ecuador. Consider how studying mammals helps us understand how the Earth is changing. Get a glimpse of the modern technologies used to describe species and their environments. Ponder how much biodiversity still awaits discovery.
Post-Program: Curiosity Continues

The National Museum of Natural History’s education webpage [https://naturalhistory.si.edu/education](https://naturalhistory.si.edu/education) offers a variety of different follow-up opportunities for your students. Students can conduct an investigation with an online activity, jump into science stories, watch a webcast, or explore science in action.

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<tr>
<th>TEACHING RESOURCES</th>
<th>THE ENCYCLOPEDIA OF LIFE</th>
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<td></td>
<td><a href="http://eol.org/">http://eol.org/</a></td>
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<tr>
<td></td>
<td>This free, online resource provides information about all life on Earth in text, images, video, sounds, maps, classifications, and more. It is a database with unlimited applications for investigating the living world.</td>
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<table>
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<tr>
<th>HOW SCIENCE WORKS</th>
<th><a href="http://undsci.berkeley.edu/article/howscienceworks_01">http://undsci.berkeley.edu/article/howscienceworks_01</a></th>
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<td></td>
<td>Experience a more accurate representation of the process of science using an interactive flowchart to investigate testing scientific ideas, exploration and discovery, benefits and outcomes, and community analysis and feedback. The site also has an extensive list of teaching resources.</td>
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<th>EXHIBIT CONNECTIONS</th>
<th>OBJECTS OF WONDER</th>
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<td>Explore the breadth and splendor of the Museum’s collection through some of our most significant and beautiful artifacts and specimens. Collections of real objects are what this museum is all about. Smithsonian researchers examine objects with a variety of scientific tools to reveal hidden complexities, while cultural communities turn to our collections to revitalize their traditions. From their astonishing scale to surprising form to awe-inspiring rarity—experiencing these objects in person creates moments of wonder and curiosity that can’t be found elsewhere.</td>
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<tr>
<th>LIVE SMITHSONIAN SCIENCE HOW WEBCASTS</th>
<th>Smithsonian Science How delivers real-world science into classrooms through free, interactive, live webcasts and supporting classroom resources. The 30-minute programs feature the research and personalities of the Smithsonian’s National Museum of Natural History, providing your students with positive STEM role models, information about science careers and pathways, and connections to current research. Every webcast includes a package of standards-aligned teaching resources that includes lessons, activities, and other resources that highlight science content and practice.</th>
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<td><a href="https://naturalhistory.si.edu/education/distance-learning">https://naturalhistory.si.edu/education/distance-learning</a></td>
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<tr>
<th>SMITHSONIAN SCIENCE HOW VIDEO LIBRARY</th>
<th>Visit our video library to watch the collection of dozens of Smithsonian Science How videos, featuring experts and topics in the subject areas of earth science, life science, paleontology, and social studies. Each video has a complementary package of standards aligned teaching resources that include lessons, activities, and other resources that highlight science content and practice.</th>
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Associated Standards

Participating in *Collections Challenge* supports students in being better able to meet the following standards. The degree to which standards are addressed will depend on student participation, preparation, and connections made in the classroom.

*Please note that each group will be assigned to different research departments during this school program which will heavily influence the standards that are met for that group.*

Next Generation Science Standards

<table>
<thead>
<tr>
<th>MIDDLE SCHOOL</th>
<th>HIGH SCHOOL</th>
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<tbody>
<tr>
<td><strong>MS-LS1 FROM MOLECULES TO ORGANISM: STRUCTURES AND PROCESSES</strong></td>
<td><strong>HS-LS2 ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS</strong></td>
</tr>
<tr>
<td>MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.</td>
<td>HS-LS2-6 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.</td>
</tr>
<tr>
<td>MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.</td>
<td><strong>HS-LS4 BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY</strong></td>
</tr>
<tr>
<td><strong>MS-LS2 ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS</strong></td>
<td>HS-LS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.</td>
</tr>
<tr>
<td>MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.</td>
<td>HS-LS4-5 Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.</td>
</tr>
<tr>
<td>MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.</td>
<td><strong>MS-LS4 BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY</strong></td>
</tr>
<tr>
<td><strong>MS-LS4 BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY</strong></td>
<td>MS-LS4-1 Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.</td>
</tr>
<tr>
<td>MS-LS4-2 Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.</td>
<td><strong>MS-LS4-2</strong> Construct an argument supported by scientific evidence that common ancestry and biological evolution are supported by multiple lines of empirical evidence.</td>
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