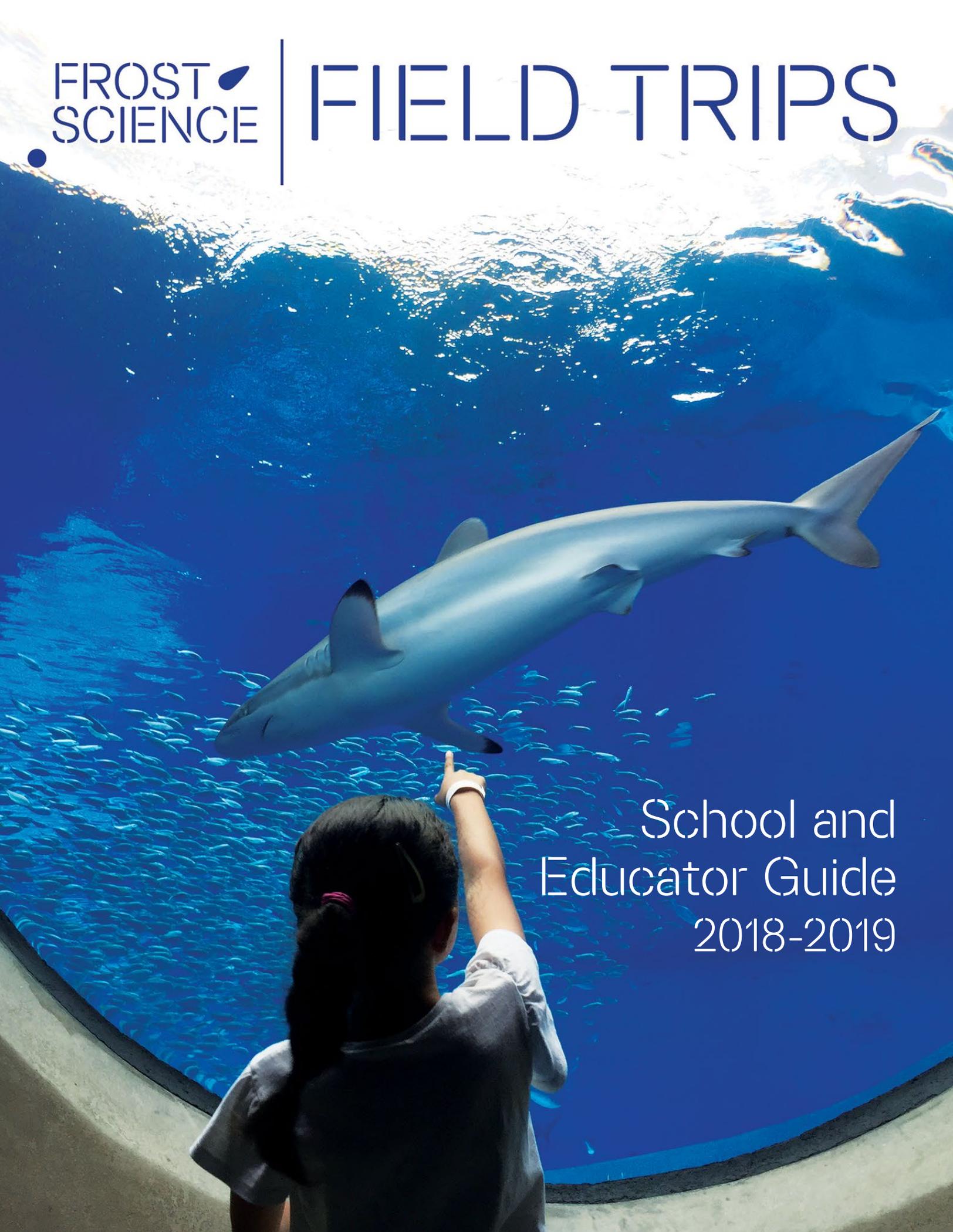


FROST
SCIENCE

FIELD TRIPS

A young girl with her hair in a ponytail, wearing a light-colored shirt, is seen from behind, pointing her right index finger towards a large shark swimming in a circular aquarium tank. The shark is white and sleek, swimming horizontally. The water is a deep blue, and there are many small, silvery fish swimming around the shark. The top of the image shows the surface of the water with light reflecting off it.

School and
Educator Guide
2018-2019

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PHILLIP & PATRICIA FROST MUSEUM OF SCIENCE
1101 Biscayne Blvd, Miami, FL 33132 | 305-434-9600 @FROSTSCIENCE



The Phillip and Patricia Frost Museum of Science is supported by the Miami-Dade County Department of Cultural Affairs and the Cultural Affairs Council, the Miami-Dade County Mayor and Board of County Commissioners of Miami-Dade County. This project is supported by the Building Better Communities Bond Program and the City of Miami. Sponsored in part by the State of Florida, Department of State, Division of Cultural Affairs, and the Florida Council on Arts and Culture. The museum is accredited by the American Alliance of Museums, is an affiliate of the Smithsonian Institution and a member of the Association of Science and Technology Centers. Frost Science is an accessible facility. All contents ©Phillip and Patricia Frost Museum of Science. All rights reserved.

Message from the President & CEO



Hello and Welcome,

Since the Phillip and Patricia Frost Museum of Science opened its doors to the public in 2017, we have been honored to welcome over one million visitors from around the world to our campus. We've also been privileged to share our museum, programs and resources with students and educators like you.

Our multiple exhibitions, engaging programming and riveting live shows have inspired teachers and students alike, sparking wonder and investigation in classrooms throughout the community. From sharks gliding smoothly through the water, to the science behind creating the perfect paper airplane, Frost Science has something for science lovers of all ages. We have permanent exhibitions you can plan curriculum around from one year to the next, as well as a schedule of nationally touring special exhibitions that ensure there will always be something new for you to see at the museum.

We have been warmed by the positive feedback from educators during our first full school season and are consistently striving to improve the experience year-round. The leadership and staff at the museum values your support and is committed to exceeding your expectations—whether you're planning a field trip, visiting us using educator benefits or taking advantage of our online learning resources.

Frost Science is here to support your curriculum and serve as a resource in the education of your students.

A handwritten signature in blue ink, appearing to read "Frank Steslow". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Frank Steslow, President & CEO
Phillip and Patricia Frost Museum of Science

Planning Your Visit to Frost Science

Time to put down your pens and pencils... and make your way to the Phillip and Patricia Frost Museum of Science! Our field trips engage students of all ages with numerous interactive and educational exhibitions that explore the world of science, technology, engineering, art and math (STEAM) in a fun and novel way. Turn the museum into a dynamic classroom for the day as your students learn about the science behind marine ecosystems, the biology of the human body, the physics of flight, the Everglades, the process of engineering and much more.



Organizing a field trip to Frost Science is easy! You'll need to:

- ✔ Plan your trip at least three weeks in advance.
- ✔ Confirm permission for the trip with your school administration.
- ✔ Pick three potential dates for your school trip that work with your school calendar.
- ✔ Confirm that your school buses will be available on those days.
- ✔ Select your field trip program and go to frostsscience.org/fieldtrips to begin the online registration process.
- ✔ Look out for an invoice and confirmation email after your reservation request has been submitted.





Field Trip Choices

There are **three** ways to visit Frost Science. For each experience, one adult chaperone is **required** for every 10 children. Book your field trip for earlier in the school year and save!

1 Museum Exploration

This option allows you and your students to explore all the areas of the museum. Free curriculum resources are available on the museum's website to assist you in connecting your visit to your classroom curriculum. On the following pages, you can learn more about the different exhibitions waiting for you to explore.

The price for this experience is:

Student	\$14.95
Additional Adult	\$14.95

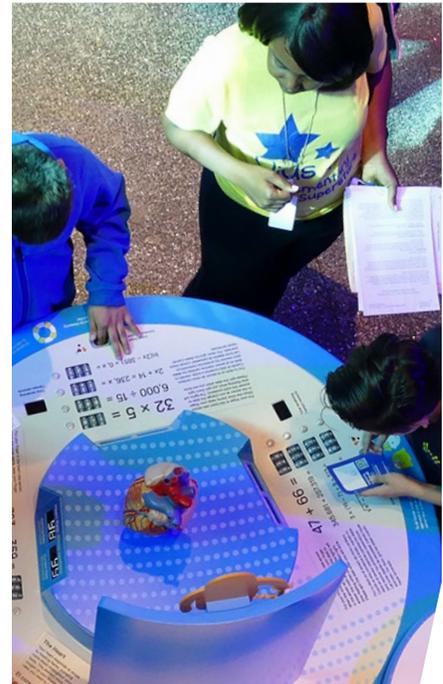
VISIT ON THESE DATES AND SAVE

AUGUST 20, 2018 – OCTOBER 19, 2018
 (during these dates, a Frost Planetarium show is available at no additional cost)

Student	\$11.95
Additional Adult	\$11.95

OCTOBER 20, 2018– MARCH 15, 2019

Student	\$12.71
Additional Adult	\$12.71



2 Museum Exploration + Frost Planetarium Show

In addition to exploring all the exhibitions the museum offers, you and your students will also get to enjoy a show in our state-of-the-art Frost Planetarium.

The price for this experience is:

Student	\$16.95
Additional Adult	\$16.95

VISIT ON THESE DATES AND SAVE

AUGUST 20, 2018 – OCTOBER 19, 2018

Student	\$11.95
Additional Adult	\$11.95

OCTOBER 20, 2018– MARCH 15, 2019

Student	\$14.71
Additional Adult	\$14.71



3 Museum Exploration + Private Facilitated Experience

This option allows you and your students to explore all of the exhibitions as well as participate in a 45-minute facilitated, hands-on learning experience in our Knight Learning Center. There are several topics to select from, with experiences that are tailored to connect to kindergarten through 12th grade standards. This program can accommodate a maximum of 30 students per class and is subject to availability. This option is only available during the academic school year.

*Please check with your reservation representative if you are interested in adding a Frost Planetarium show.

The price for this experience is:

Student	\$18.95
Additional Adult	\$18.95

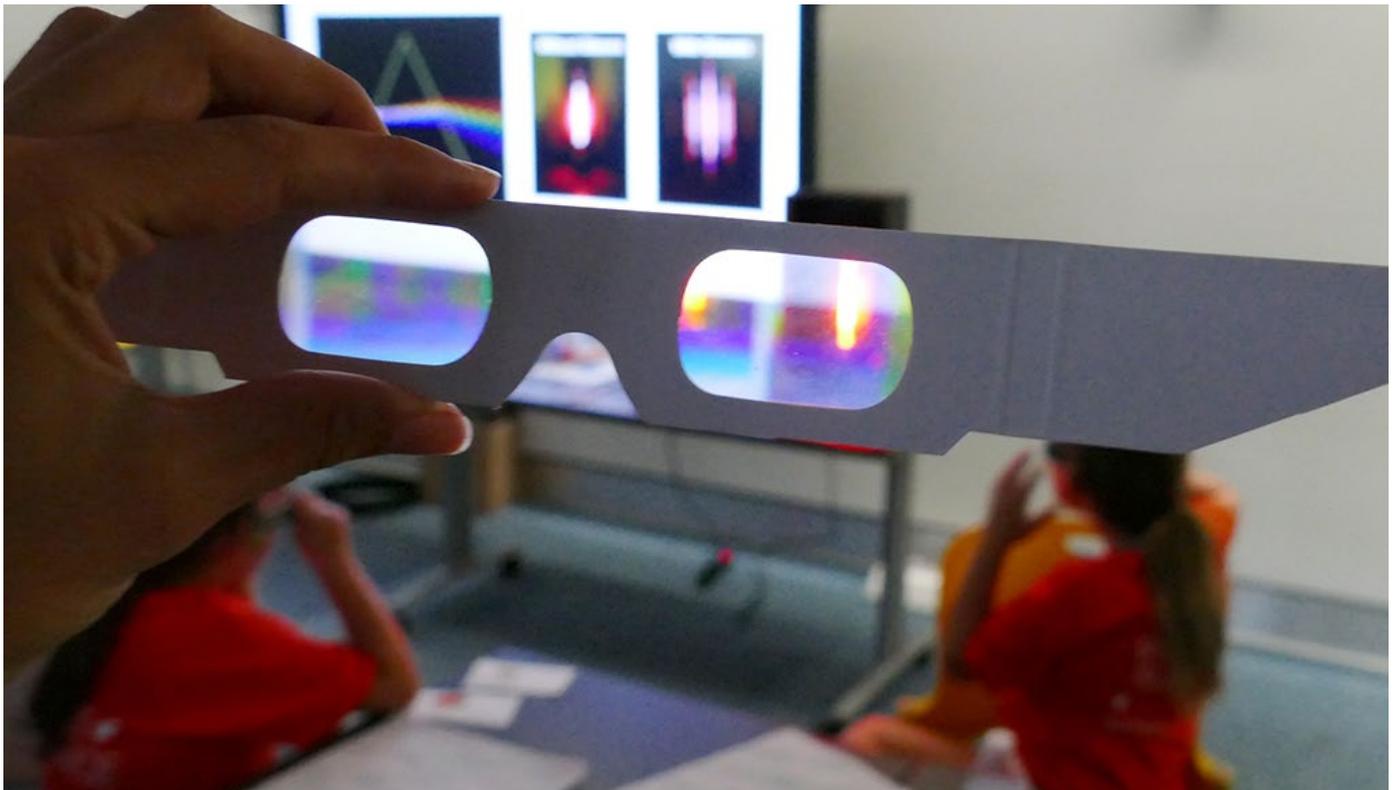
VISIT ON THESE DATES AND SAVE

AUGUST 20, 2018 – OCTOBER 19, 2018

Student	\$15.95
Additional Adult	\$15.95

OCTOBER 20, 2018 – MARCH 15, 2019

Student	\$16.71
Additional Adult	\$16.71



Experience Options:

Grades K-2

Crocogators

Young biologists will sink their teeth into the world of some of the oldest animals on Earth: crocodiles, alligators, caimans and gharials! Students will go on a journey that follows the evolution of these remarkable reptiles while exploring their unique adaptations through engaging activities, including a special viewing of both crocodile and alligator skulls from our museum's collection. Then, students will compare physical features of alligators and crocodiles and choose their favorite by making their own alligator or crocodile face mask.

Sea Life Sorting

Students will sort, classify and compare shells in this ocean-and-coastal-themed experience that celebrates the biodiversity of life on Earth. Hands-on activities will allow students to observe, investigate and categorize our diverse mollusk (shell) collection gathered over decades from all around the globe, ranging from rare finds to common Florida shells. Students will learn to recognize the similarities and differences in shapes, colors and sizes, and will be guided to identify and match each sea creature's needs with their environment and habitat.

Wind Tunnel Design

Young inventors will get to put their engineering skills to work as they investigate how to make flying contraptions go higher, further and faster. Using a variety of materials (including some everyday objects), students are encouraged to imagine and create their own flying contraptions before testing them out in our vertical wind tunnel. Their flying contraptions will go through different challenges, all encouraging design readjustments and trial and error—a necessary part of the engineering process.

Grades 3-5

Building the Future

Students will have the chance to let their creativity flow as they prepare to become the next generation of problem solvers by exploring the fundamentals of engineering. This hands-on introduction to the engineering design process will encourage creative thinking, team work and perseverance while students tackle a bridge building challenge. Teams will plan, build and test how their designs respond to various weight and length demands and then be challenged to redesign and retest to create the ultimate bridge.

Fingerprints of Light

Students will have the opportunity to jump into an astrophysicist's shoes as they study how light's properties and behavior are applied to astronomy and human space exploration. Students will experiment using tools like color filters, diffraction gratings and colorful spectrum gas tubes to note how gases (especially the ones we as humans need) emit light and have their own unique light pattern, or "fingerprint." Practicing the principles they've learned, they will then decide whether to pursue space exploration to different case planets by analyzing their light spectrums.

Plankton Racing

Students will explore the variety of adaptations involved in helping marine creatures survive by focusing on the ocean's most crucial organisms: plankton. Students will uncover the important role plankton play in food webs by examining a wide range of plankton preserves under a microscope, including some from our very own Biscayne Bay. They will then be challenged to construct their own plankton models to simulate how body shape affects their movement through a complex ocean. Finally, students will test their creations and compete to see which of their designs fares best in the water.

Grades 6-8

Fluorescing Fish

Students will light up with curiosity as they explore the science of luminescence. Starting with an exploration of the properties of light and identifying examples of how luminescence exists in the natural world, students will then take a closer look at how fluorescence, a form of luminescence, is used as a scientific tool by exploring a real-world application in biology where genetically modified fluorescence fish are used to better understand genetics.

Squid Dissection

Students will dive into a slimy (and sometimes smelly!) dissection that investigates the biology of one of the Earth's most highly developed invertebrates: squid. Students will examine and identify the special and unique features and adaptations these mollusks have developed over time to help them survive. They'll also

analyze the squid's role in the marine food web along with the characteristics they share with their mollusk relatives. Don't worry, the smell comes off with a little soap and water—but the memory lasts forever!

Grades 9-12

Tools for Discovery

Scientists use a wide range of specialized equipment to study and better understand the world around them. Students will investigate the impacts of environmental stressors on corals through data analysis of samples from a high-power nanosecond laser. Students will also meet the scientists of the Inventors in Residence Lab with a behind-the-scenes tour that allows them to see the corals and laser up close.

Behind-the-scenes tour may not be available on select field trip days and content is subject to change.



Frequently Asked Questions

Questions? That's quite alright! Here are answers to some of our most commonly asked ones. You can also find more information on the website at frostsscience.org/fieldtrips.

What exhibitions can I see with my group?

The exhibitions available to groups will vary depending on the time of the year. The Inventors in Residence Lab and Design Lab: *Engineering* exhibition (excluding the workshop portion) have a limited capacity, therefore groups need to enter in smaller sizes—approximately 20 individuals—at a time. Due to time and capacity constraints, the workshop portion of the Design Lab: *Engineering* exhibition is not available to groups during field trips. Our exhibitions are subject to closure at any time without advance notification. To see all exhibitions available at Frost Science, please visit frostsscience.org/exhibition.

How do I pay for my visit?

Field trip reservations are on a first-come/first-served basis. A non-refundable deposit of \$75 or 20% of the total due (whichever is greater) must be received no later than three (3) weeks after your reservation has been confirmed to ensure your field trip date is secured. Reservations without paid deposits are subject to cancellation. Deposits can be made by credit card or check/money order. Please make checks or money orders payable to “Frost Science” and mail to:

Frost Science Reservations Department
1101 Biscayne Blvd., Miami, FL 33132

Purchase Orders (MDCPS and BCPS) can also be submitted in lieu of a deposit.

Final payments are due the day of your scheduled field trip. The museum requires that one payment be made for all reservations. The lead teacher is responsible

for collecting payment from additional chaperones attending the field trip prior to arrival. Any chaperones not included in the reservation and choosing to pay separately will pay the regular museum admission rate and will not be guaranteed seats in shows/activities scheduled for your field trip. Museum memberships are not valid for field trip entrance.

What time are field trips offered?

All field trips at Frost Science are three (3) hours in duration, typically beginning at 10:00 a.m. Groups are expected to arrive 15 minutes prior to their scheduled start time. NOTE: Late groups might miss scheduled activities, and will not have an opportunity to reschedule for later shows or receive a refund.





Plan for Success!

Prior to Your Visit

- Complete required school documentation (field trip permission forms, transportation forms, etc.)
- Secure chaperones for the field trip and ensure they are aware of arrival and departure times.
- Confirm your final head count. Chaperones not included in the reservation and choosing to pay separately will pay the regular museum admission rate and will not be guaranteed seats in shows/activities scheduled for your field trip.
- Place any lunch orders with the reservations team. Lunch orders require a final count five (5) business days prior to your field trip date or the original reserved number will be used.
- Review field trip learning resources located at frostsscience.org/fieldtrips.

Day Before the Field Trip

- Assign student groups to chaperones (10 students per one chaperone required).
- Prepare final payment, which is due upon check-in at Frost Science. Final payment is due in the form of a single check, cash or credit card via one transaction. No refunds will be issued after the payment has been received.
- If the school is not paying for additional chaperones, please ensure that the chaperones know which venues/ shows they will need to purchase tickets for and that admission to the same venues/shows being attended by the students may not be available at the time of purchase. Chaperones cannot use a membership to enter with a group.
- Remind students of proper museum etiquette as outlined in the field trip confirmation documentation.

Day of Field Trip: Arrival

- Please arrive 15 minutes prior to your scheduled start time. Museum staff will direct bus drivers to the appropriate drop-off location; however, please note that we do not provide school bus or motor coach parking. Visit www.miamiparking.com for bus parking options. (Paid automobile parking is available in the museum parking garage at the posted rates.)

- Field trip guests should remain on the buses for an orientation from a museum representative.
- After the orientation, the lead teacher will need to go to ticketing to pay any remaining balance for the field trip.
- Lunches brought to the museum will be unloaded from the bus by the teachers and chaperones and pre-collected in large bins (no large plastic bags or individual lunch bags/boxes will be accepted) and must be clearly labeled with the school name and lead teacher's name.
Note: refrigerated storage will not be available.
- If you are running late for any reason, please contact the reservations office at 305-434-9564.

Day of Field Trip: During Your Visit

- All tours are self-guided; therefore, it is the chaperones' responsibility to arrive to ticketed shows on time.
- Chaperones must remain with their students throughout the visit and are responsible for their group's behavior.
- For everyone's safety, no running or rough play is permitted. Please emphasize the importance of using inside voices while at the museum.
- If your group visits the museum's gift store, please note that a maximum of 15 students (accompanied by a chaperone) are allowed at a time.

We want our visitors to enjoy their experience at Frost Science and expect all groups to respect other visitors. If these guidelines are not followed, you may be asked to leave the museum. If this occurs, you will not be refunded for your visit.

Day of Field Trip: Departure

- When your group is ready to depart, please call for your bus only when your entire group is at the bus pick-up area and ready to leave. Buses will not be allowed to wait in the designated pick-up lanes for your group to arrive and will need to exit the museum drive if your group is not ready to leave.

Cancellation

If you must cancel your field trip, please send written cancellation no less than 10 business days prior to your visit. Written cancellations must be sent via email (fieldtrips@frostsscience.org).

Please note that deposits are non-refundable. Deposits are transferable, however, and can be used towards a future field trip. This credit must be used within one (1) calendar year from the date paid. After this date, the non-refundable deposit will be donated to the Frost Science general fund.

For additional questions, please contact the reservations department at 305-434-9564 or fieldtrips@frostsscience.org

Field Trip Lunch

A pre-ordered meal can make lunchtime a little more convenient for you and your students. Options include your choice of sandwich (ham, turkey or vegetarian), a bag of chips and bottled water. These can be ordered online in advance of your visit at frostsscience.org/fieldtrips.

Field Trip Lunch	\$8.00 per person
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Funding to Support Your Visit

Frost Science and its generous supporters are committed to making field trips accessible for your students and have the following opportunities in place to assist you with your visit.



Funding for General Admission:

Through the support of our donors, Frost Science is able to provide free or discounted admission to groups visiting from Title I schools and non-profit community-based organizations. This discounted or free admission is subject to the availability of funding. Please visit frostsscience.org/fieldtrips for more information.

Healthy Mind, Healthy Body: 4th Grade Field Trip

Fourth grade students attending Miami-Dade County Public Schools are invited to participate in a special field trip designed specifically for them—free of charge. This field trip, generously sponsored by Baptist Health South Florida, features a visit to the MeLaß in the Baptist Health South Florida Gallery, where students will have an opportunity to learn about how everyday choices can impact one’s health and happiness. The field trip also includes an opportunity to visit a second exhibition in the museum (exhibition depends on time of year), as well as standards-based pre-and post-visit materials to help ensure your experience is well-connected to the classroom curriculum.

The program is available Monday through Thursday on all regular MDCPS school days, excluding holidays and teacher planning days. The session is from 10:00 a.m. to 1:00 p.m. and includes time for students to break for lunch.

To learn more about the program, including registration and access to additional resources, please visit frostsscience.org/melabfieldtrip.



Baptist Health South Florida

Time to Explore

Frost Science has an engaging roster of exhibitions that promise to spark wonder, investigation and discovery for students of all ages. From dinosaurs to the vibrant ecosystems of South Florida, you'll explore a variety of topics while at the museum. Learn more about each one to find connections to your classroom curriculum goals.



Our Exhibitions

Aquarium

A masterpiece of living science, the three-level Aquarium (Vista, Dive, Deep) carries you from the surface to the depths of South Florida's crucial aquatic ecosystems and beyond.



Royal Caribbean Vista

Level 4

A massive outdoor deck, the Vista level puts you at the surface of key South Florida ecosystems. In the 500,000-gallon Gulf Stream Aquarium, mahi-mahi and scalloped hammerhead sharks cruise the waters, while rehabilitated green herons navigate the spaces of the Mary M. and Sasha A. Spencer Aviary. Red mangroves and a 22-foot gumbo limbo hold court just beyond the Florida Bay Touch Experience, where you can meet and touch gentle stingrays that thrive in our state's shallow backwaters.

Dive Level

Level 3

Throughout the Dive level, nearly 30 aquariums and interactive vessels offer an intimate view into the subtropical sea, where colorful damselfish dart through corals and predators search for their bait through mangrove forest shadows. At the Dive Bar, students will get an up-close encounter with some of our favorite marine invertebrates and learn about their unique features.

Deep Level

Level 2

With a revealing look at the mysterious and vast depths of the Gulf Stream, the lowest level of the aquarium is where drifters such as jellies reside. A one-of-a-kind 31-foot-wide oculus lens forms the bottom of the Gulf Stream Aquarium and gives you a direct view of the scalloped hammerhead sharks and tuna swimming overhead.





Design Lab: *Engineering*

Part exhibition, part laboratory, guests will learn about the challenges engineers face while putting their critical thinking skills to the test in a laboratory setting. In this exhibition, students will encounter vintage iterations of everyday objects and discover how engineering challenges were solved. They'll also participate in hands-on activity tables that will help them learn about the engineering design process first-hand.

Please note: due to time and capacity constraints, the workshop portion of Design Lab is not available to groups during field trips.



Feathers to the Stars

The Batchelor Foundation Gallery, Supported by Christine Allen

Discover the amazing story of how ancient evolution gave birth to animal flight and how humans used imagination and engineering to get airborne and travel to outer space. Students will come face-to-face with a 30-foot dinosaur, the *Yutyrannus huali*, while exploring interactive stations with handrails that reveal the secrets of birds' biomechanics. They'll meet the daredevil inventors who pioneered human aviation by risking their lives to figure out the aerodynamic principles of thrust, drag, weight and lift before building and launching their own air rockets in an exploration of the physical laws that guide rockets through the Earth's atmosphere.



MeLaβ

Baptist Health South Florida Gallery

MeLaβ guides students through the amazing ways the body and mind work together and how daily choices contribute to their health. In this exhibition, they'll get to challenge their brain with problem-solving tasks, stop a 'virtual virus' or learn how dance can be a healthy form of exercise. Their partner in MeLaβ is beta, a digital character they'll build as they answer questions in each learning zone. The more questions they answer, the more they'll customize beta, and learn about themselves.



River of Grass

William R. Kenan, Jr. Charitable Trust Gallery

The wet, wild and mysterious River of Grass provides young explorers with an interactive way to learn more about the Everglades through two related spaces. In the outdoor area, children see, feel and experiment with the physics of water, introducing them to the concepts that keep the 300-mile Everglades and all its creatures alive. Inside, children venture into an interactive virtual environment where animal characters come to life during a “day in the life” of the Everglades. They’ll chase otters, spot a panther using a flashlight, and by the end of the journey, learn that life in the Everglades is rich and worth protecting. This exhibition is specially designed for children 3-6 years of age.



The Sun Spot

Florida Power & Light Company Solar Terrace

Experience the power of the sun as a renewable source of energy through several interactive solar-powered activities. Begin by feeling the power it takes to energize everyday objects with an outdoor bike or hand crank. Then, discover the science and engineering behind solar panels and explore the dynamic nature of the sun while safely viewing it with a Sunspotter. Students are also invited to get into the engineering mindset as they investigate why we need different types of renewable energies and explore why innovation in batteries may be the solution to the future of clean energy.



Frost Planetarium

One of the most advanced spaces like it in the United States, the 250-seat Frost Planetarium uses 16-million-color 8K projection, surround sound and a vast dome screen to take students on a visual joyride that both thrills and educates. The dome is tilted forward at 23.5 degrees, allowing its 67-foot span to fill viewers’ field of vision and make it feel as if they’re flying. Imagery comes in from above, below and around peripheral edges, creating a nearly 360-degree view of whatever world your students are exploring—from the depths of the ocean to our universe and beyond. Frost Planetarium also displays spellbinding laser light events, innovative live programming and is available for private presentations.

Special Exhibitions

Frost Science also has spaces dedicated to nationally touring temporary exhibitions. This ensures a regular rotation of topics and experiences for you and your students to explore.



Da Vinci – Inventions

Now through January 13, 2019 | West Wing, Levels 2 and 3

Da Vinci – Inventions, presented locally by Bank of America, celebrates one of the most revered and dynamic minds of all time: Leonardo da Vinci. The exhibition features 16 compelling themed areas of da Vinci's work, offering you an unmatched look inside the mind of a man who laid the groundwork for some of modern society's most impactful inventions such as the helicopter, airplane, automobile, submarine, parachute and bicycle. Suitable for all ages, this amazing exhibition provides a fascinating insight into not only the mind of a genius, but also into the fundamental scientific and artistic principles that he discovered.

Da Vinci – Inventions was developed by Grande Exhibitions, under the kind auspices of the Commune di Roma, Commune di Firenze and Citta Di Venezia.



Creatures of Light: Nature's Bioluminescence

October 6, 2018 – April 21, 2019 | Hsiao Family Special Exhibition Gallery

Ever wonder why some organisms flash, blink or glow? Get ready to shed some light on these extraordinary organisms during *Creatures of Light: Nature's Bioluminescence*. From the flickering fireflies found in backyards around the world to the alien-like deep-sea fishes and other fantastic creatures that illuminate the perpetually dark depths of the oceans, you'll explore the biology behind these amazing creatures through interactive experiences and recreated environments.

Creatures of Light: Nature's Bioluminescence is organized by the American Museum of Natural History, New York (amnh.org), in collaboration with the Canadian Museum of Nature, Ottawa, Canada; and The Field Museum, Chicago.

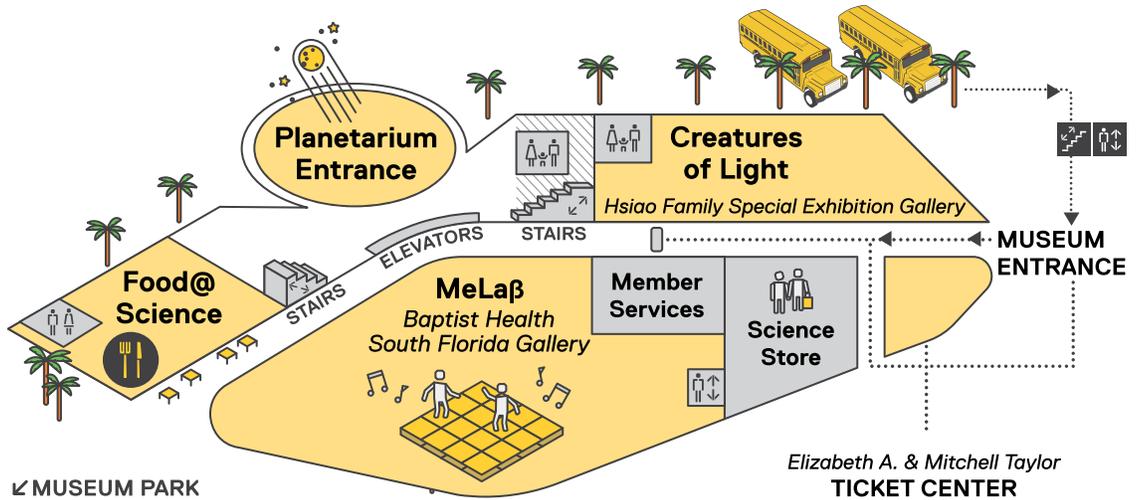
To see all current exhibitions, please visit frostsscience.org/exhibition.

MUSEUM FLOOR PLAN

STAIRS
 ELEVATORS
 RESTROOM
 FAMILY RESTROOM
 CAFÉ
 NON-PUBLIC AREA

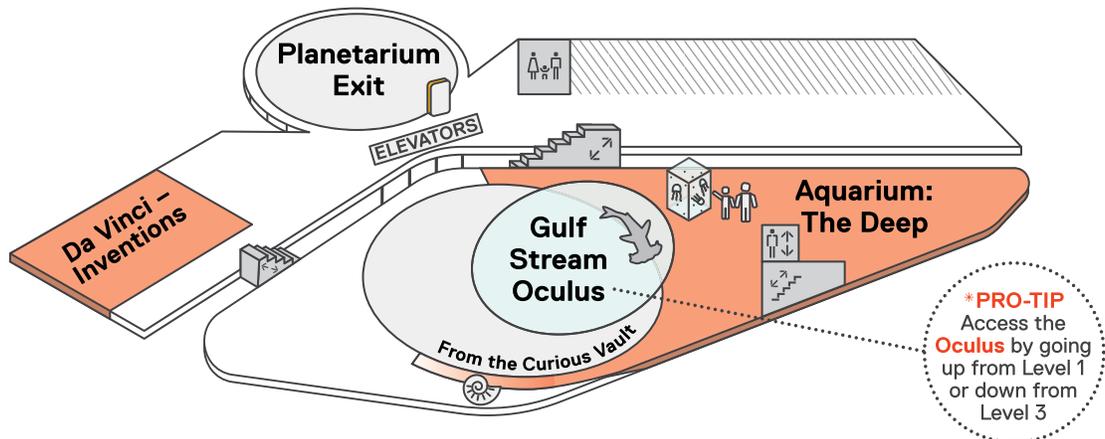
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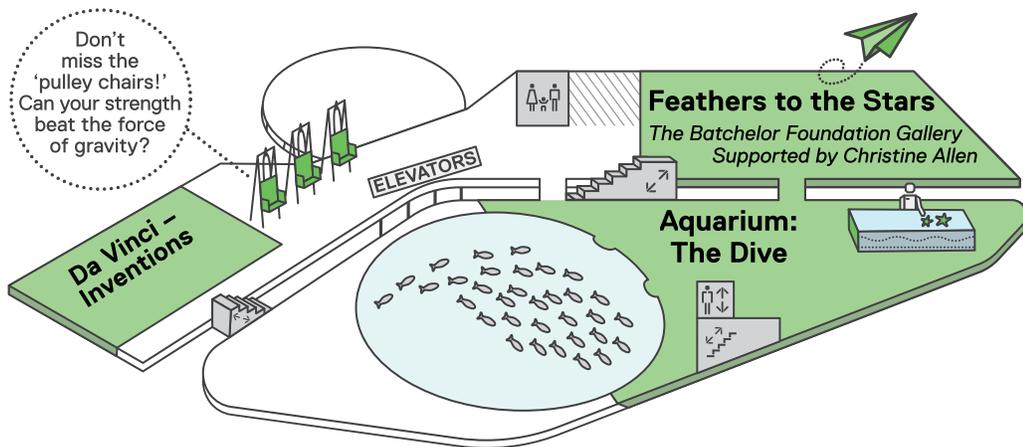
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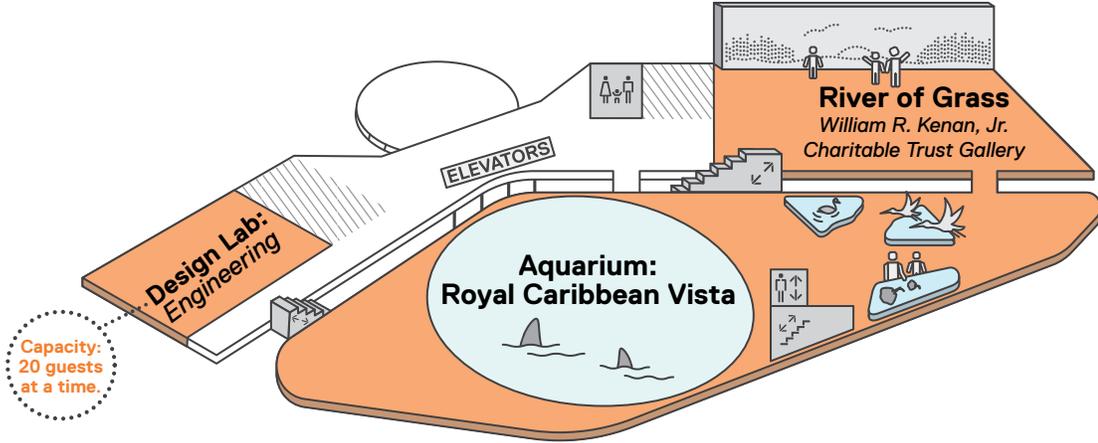
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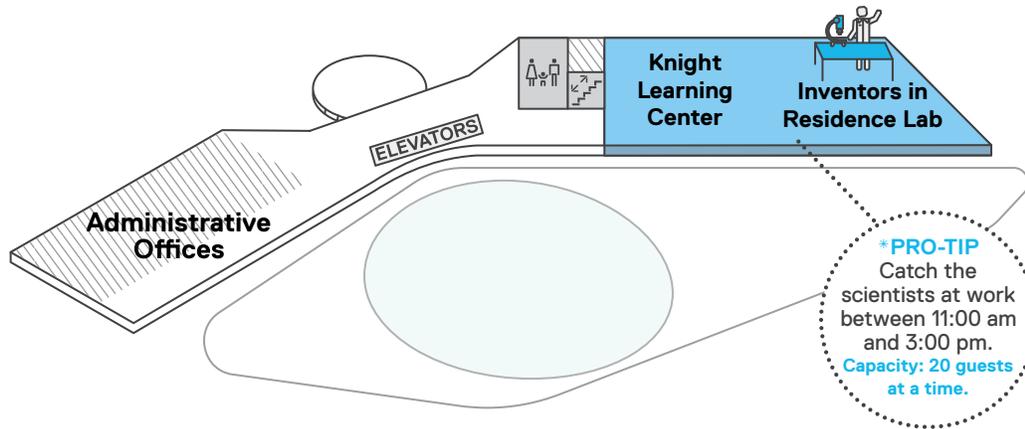
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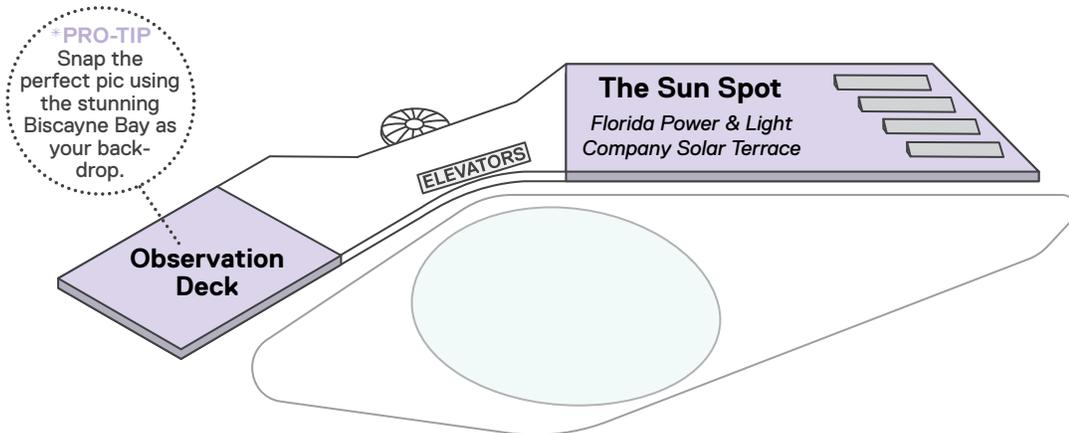
LEVEL

5



LEVEL

6



For the safety of our animals and divers, please, no flash photography.



Food, drinks, gum and smoking are not allowed in museum galleries and exhibitions.



All galleries and exhibitions are wheelchair accessible.



Frost Science is a smoke-free facility. No smoking or vaping on property.

Additional Educator Resources

We know educators are incredibly busy. To help you prepare for your field trip—as well as reinforce the lessons learned at the museum back in your classroom—we've created standards-based pre- and post-visit materials for grades pre-K - 8 that align with each of our exhibitions. These resources include activities to use before and after your visit, and provide insight into what you can expect during a Frost Science field trip.

Standards-aligned curriculum materials can be downloaded free of charge from frostsscience.org/fieldtrips.

Special Admission for Educators

Previewing a field trip destination can be helpful in planning how to share the experience with students. Frost Science is committed to supporting educators in achieving this goal.

Miami-Dade County Public Schools' educators can receive free general admission for themselves on any regular admission day to Frost Science by showing a valid school ID. Educators from other districts and private schools can receive a 15% discount on general admission. Planetarium shows or special programs carry an additional fee.

Please note: there is limited self-parking available in the museum garage during regular museum hours. This parking can fill up quickly. Rates are \$8 for the first hour and \$4 for each additional hour with a maximum daily rate of \$40. For a more economical option, you can also access the museum via public transportation. Detailed parking information can be found at frostsscience.org/parking.







For more information or to reserve your field trip, please visit frostsscience.org/fieldtrips.

For additional assistance, please email fieldtrips@frostsscience.org or call 305-434-9564.

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