



*Tour:*

## PHYSICS, PARTICLES & PROGRESS BOSTON STEM

*Location:*

Boston, Massachusetts, USA

*Specialization:*

Physics, General Sciences & History

*Itinerary:*

6-days / 5-nights

*Availability:*

Year-round

# PHYSICS, PARTICLES & PROGRESS

## Boston, Massachusetts

Day		Morning	Afternoon	Evening
1	Sun	Travel to Boston, Massachusetts; transfer to hotel & check-in		Welcome Dinner
2	Mon	Harvard Physics Master Class at Mazur Lab	Harvard Museum of Natural History & Peabody Museum	University of Massachusetts Lowell Open-Pool Nuclear Reactor & Particle Accelerator Tour
3	Tues	MIT Nuclear Reactor Tour & MIT Campus Tour	MIT Master Class "Catching Physics in the Act"	Broad Discovery Center of MIT & Harvard
4	Wed	Boston Tea Party Ship Experience	Harvard University Campus Tour	Freedom Trail American History Walking Tour
5	Thur	Guild Hall Makerspace Workshop / Guided Project	Boston Museum of Science, IMAX & Charles Hayden Planetarium	
6	Fri	Top Golf + Physics "Projectile Motion" Learning Lab	Afternoon departure to Home	



As with all sample itineraries, please be advised that this is an 'example' of a schedule and that the activities and hotels shown may be variable dependent upon dates, weather, special requests and other factors. Itineraries will be confirmed prior to travel.



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## Day 1

Dinner

**Boston....** An American city like no other, Boston is a true original! Hip and historical, full of passion and pride regarding both their city and their sports teams, Bostonians revel at the chance to tell you how great their town is. But this town has more to offer than world champion sports teams and the site of the world's best-known tea party. With over 23 million visitors per year, Boston ranks as one of the most visited cities in the United States.



As the capital of the Commonwealth of Massachusetts, Boston embodies a distinct European feel which is evident in the city's culture. The city's role in the American Revolution has led to the nickname, the "Cradle of Liberty" and groups will be amazed at all the sights showcasing historical wonders around every corner. Boston is a city of progressive culture and attitude blended with stylish sophistication and historic New England charm. Historical buildings, parks and cemeteries are national landmarks, and the city boasts the birthplaces of famous patriots, presidents and politicians. Also referred to as the "Walking City", Boston is centered on the country's oldest public park, Boston Common.



## Did you know?

- ✓ Boston was the site of America's first metro system.
- ✓ Boston is known as "the Athens of America," a reference to the city's more than 100 colleges and universities. The city of Boston has the unique distinction of being home to both the first public school and the first college in America.
- ✓ Why is Boston called Beantown? Here's the story: When the Puritans arrived from England to Boston, they were forbidden to cook on the Sabbath. Church services often lasted 8-hours and were mandatory for all



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members of the community. When the congregants returned home they were often cold and hungry, so the solution was to put a pot of beans on the hearth on Saturday, with a piece of meat - usually salt pork, and a sauce of water and molasses to keep the beans from burning. This was the one hot meal that children could serve to themselves while the adults remained at the services. Children were generally required to be at services from morning until 2PM and adults remained until 4 or 5 in the afternoon. Those that failed to attend church services were put in cages on Boston Common where they did penance equivalent to the time they missed in church. Family members could bring other family members a hot meal and because it was easy to transport, it was often the pot of Boston baked beans. After being on the hearth for more than a day, the molasses became thick and fortified the congregants on the cold days.

- ✓ St. Patrick's Day was first celebrated in North America in 1737, in Boston.
- ✓ Boston is reported to have more Irish descendants than the country of Ireland.
- ✓ Ever wonder how Fig Newton's got their name? They were named after Newton, Massachusetts, a suburb of Boston.
- ✓ Boston's best-known dishes are clam chowder, fish and chips, baked beans, lobster and steamed/fried clams.

Groups participating in **Physics, Particles & Progress** will generally arrive the city in the afternoon. After check-in, we'll have our **Welcome, Safety & Orientation Meeting** and then have a relaxing evening before we hit the ground running tomorrow. If you arrive early enough, we're happy to help with added activities, we just keep the first day open until travel times are known to accommodate various arrivals.



**Sample Hotel – Fairfield Inn Boston-Woburn/Burlington:** This hotel is located in the historic Woburn community and offers all the comforts to maintain your balanced routine during your stay. Relax in spacious rooms with complimentary Wi-Fi, plush bedding, and mobile workstations. Stay active with cardio equipment and free weights in the hotel fitness center and unwind in the refreshing seasonal outdoor pool. Additional amenities include a sundries market, lobby business station, in-room coffee & tea, onsite laundry, mini-fridges and hair dryers. Continental breakfasts are included at your hotel. Students generally sleep 4 to a room in rooms with 2 queen beds. Staff generally sleep 2 to a room.

**Accommodation Note:** Groups will generally stay outside of the city center to save unnecessary costs, however if you desire a city-center hotel, please let us know and we'll be happy to resource a city property.

If you find you arrive early enough and have a bit of extra time, may we suggest that this evening is perfect for a historical Ghost & Gravestones Tour. Let us know if we may add this to your itinerary.



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## Day 2

Breakfast & dinner

Rise and shine Boston! After breakfast at our hotel, we'll head to Harvard University for a Physics Master Class at Mazur Labs and then time to enjoy the Harvard Museum of Natural History & the Peabody Museum!



## Department of Physics

**Mazur Labs: Harvard Physics Master Class** – Visit the John A. Paulson School of Engineering and Applied Sciences and the Department of Physics at Harvard University under the direction of Eric Mazur. Visiting schools will have an opportunity to hear from this team to understand the scope of their project and how they are facilitating it in a specialized Master Class directed by their team.

*This specific group studies the dynamics of molecules, chemical reactions, and condensed matter on very short timescales -- down to femtoseconds (millionths of billionths of a second). Physics in this ultrafast regime can only be studied using light, specifically using short laser pulses. The intensity of these laser pulses is comparable to the intensity one would obtain by focusing all the sunlight that strikes the earth on an area the size of a finger nail (ouch!). This high intensity allows us to create conditions that approach those found in stars and study a host of new phenomena. Projects are of both fundamental interest and technological relevance, and cross traditional disciplinary boundaries between physics, chemistry, materials science, and optics.*



**The Harvard Museum of Natural History** - The Harvard Museum of Natural History is housed on the campus of Harvard University in Cambridge, Massachusetts. It features 16 galleries with 12,000 specimens drawn from the collections of the University's three natural history research museums: the Harvard University Herbaria, the Museum of Comparative Zoology, and the Harvard Mineralogical Museum. In the museum's permanent galleries, students encounter the diversity of life on Earth, from dinosaurs to fossil invertebrates and reptiles, to large mammals, birds and fish, and the only mounted Kronosaurus. The mineralogical galleries present a systematic display of meteorites, minerals and gemstones. The galleries also house the Historic Ware Collection of Blaschka Glass Models of Plants, popularly known as the Glass Flowers, and the exhibit Sea Creatures in Glass, displaying some of the Harvard Museum of Comparative Zoology's collection of the Blaschka models of marine invertebrates. In addition, a series of changing exhibitions bring focus to new research at the University.



Harvard Museum of Natural History



## Peabody Museum of Archaeology & Ethnology

**The Peabody Museum of Archaeology & Ethnology** - The Peabody Museum shares cultural heritage from around the world. The Museum cares for a large and historic collection of anthropological materials from across the globe, including more than 1.2 million individual cultural items, 500,000 photographic images, and associated archival records. When visiting the Natural History Museum, you'll also be able to visit the Peabody Museum.



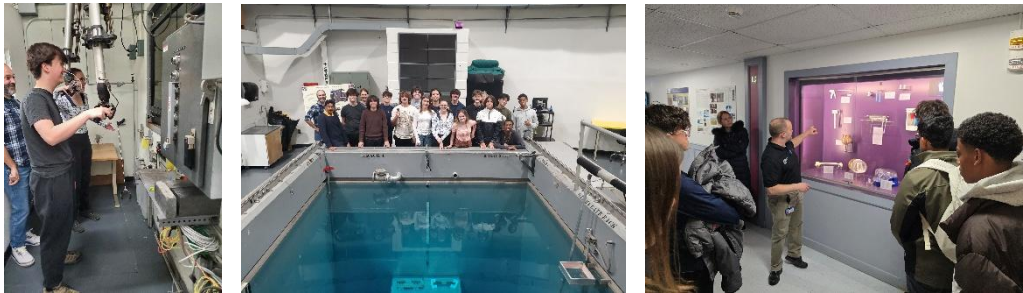
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After our morning at Harvard, we'll set our sights on UMass Lowell! Groups can choose from a Physics OR Robotics tour.

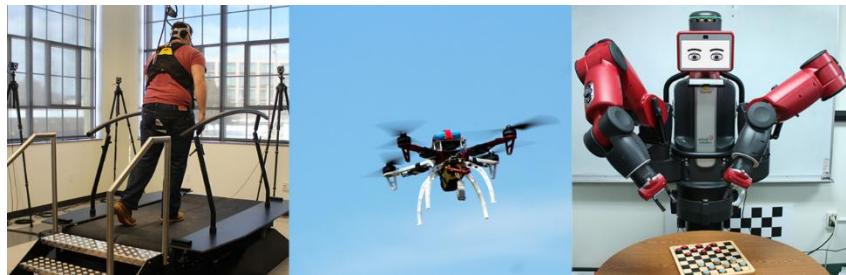
**University of Massachusetts Lowell: Open-Pool Nuclear Reactor & Particle Accelerator Tour** - UMass Lowell's cutting-edge radiation facilities offer opportunities for experiential learning and problem solving.

- The 5.5MV Van De Graaff particle accelerator allows for neutron and proton beam studies as well as proton induced X-ray emission, Rutherford Backscattering Spectroscopy, ion-beam implantation, mono-energetic neutron beams, as well as a micro beam, ends station, and sample changer for sample activation and analysis.
- Nuclear Reactor: the 1 million-watt swimming pool style nuclear reactor can be used for in-core and external beam research. Applications include neutron damage to electronics for space applications, Radiation hardening of materials (compounds, metals, plastics, etc.), digital neutron imaging, detector development and proving, new dosimetry modalities, shielding studies, etc. Neutron fluxes up to  $2.5E13$  n/cms-sec and external beams up to 1500 rem/hr neutron dose rate. Learn more on the [Radiation Laboratory website](#).



OR....

**University of Massachusetts Lowell: NERVE (Robotics Center) Facility Tour** - The New England Robotics Validation and Experimentation (NERVE) Center at the U-Lowell is a dedicated research, testing, and training facility. It's an interdisciplinary robotics testing, research, and training facility that evaluates robotic capabilities, human performance, and human-robot interaction. The mission of the NERVE Center is to improve the development of robot systems by enabling evaluation across many domains including industrial automation, exoskeletons and wearable robots, and disaster response.



After our tour, we'll set sail in the Boston Harbor for a fabulous cruise!

**Boston Harbor Dinner Cruise** – Come dine, dance and celebrate aboard a dinner cruise in Boston. Great for school groups, you'll get the chance to catch picture-perfect views of the Boston skyline like you've never seen before. Cruises are 2 – 3 hours and include a buffet dinner and a live DJ for fun!



### **Day 3**

Breakfast & dinner

Hello Massachusetts! Today we'll start with a visit to MIT.



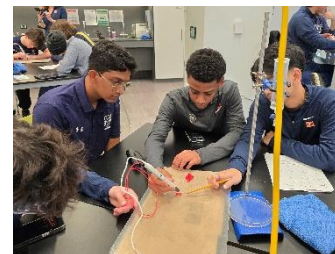
**MIT Campus Tour** - Discover MIT's staggering growth from Boston to Cambridge while experiencing strange and inventive MIT traditions. Learn about innovators who have changed the world! Tour stops include MIT Chapel, Kresge Auditorium, the Student Center, Great Dome, Media Lab, the Green Building and the Stata Center.

**MIT Nuclear Reactor Tour** - Explore MIT's Nuclear Reactor Lab through a unique opportunity to tour the MIT Reactor (MITR) and its facilities. Click [HERE](#) for a video! The MIT Nuclear Reactor Laboratory (MIT-NRL) is an interdepartmental center that operates a high performance 6 MW nuclear research reactor known as the MITR. It is the second largest university research reactor in the U.S. and the only one located on the campus of a major research university. During its long and distinguished history, the NRL has supported educational training and cutting-edge research in the areas of nuclear fission engineering, material science, radiation effects in biology and medicine, neutron physics, geochemistry, and environmental studies. It is the only university research facility in the U.S. where students can be directly involved in the development and implementation of nuclear engineering experimental programs with neutron flux levels comparable to power reactors.



The MITR is a light-water cooled and moderated, heavy-water reflected, reactor that utilizes flat, finned, aluminum-clad, plate-type, fuel elements. The average core power density is about 70 kW per liter. The maximum fast and thermal neutron flux available to experimenters are  $1.2 \times 10^{14}$  and  $6 \times 10^{13}$  neutrons/cm<sup>2</sup>-s, respectively. Experimental facilities available at the MIT research reactor include two medical irradiation rooms, beam ports, automatic transfer facilities (pneumatic tubes), and graphite-reflector irradiation facilities.

Afterwards, we'll slip over to the MIT Museum for a Master Class where students can engage in a hands-on, minds-on learning ethos rooted in problem solving and creative thinking. Students will explore physics challenges under the guidance of a museum educator.



**MIT Master Class: Catching Physics in the Act** - The splashing of water, seemingly a quick and simple event, is studied in many labs around MIT. Inspired by the works of Berenice Abbott and Harold "Doc" Edgerton,



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participants will use high-speed photography and video to slow phenomena down and discover patterns and mathematical relationships that we can use to solve real world problems.

Finally, to wrap up our day, we'll head to the Broad Discovery Center at the Broad Institute of Harvard & MIT.

**Broad Discovery Center** - The Broad Discovery Center is an active space that showcases how researchers around the world are seeking to understand and treat human disease. Visitors will learn how scientists at the Broad and their partner institutions are teaming up with collaborators across the globe to chase down the basis of psychiatric conditions, cancer, infectious diseases and more, develop new strategies for treatment, and build datasets and technologies to share with scientists everywhere. Check out the Broad Discovery Center video [HERE](#).



This evening we'll wrap up our amazing scientific day with a **Bowling & Pizza Party!**

#### **Day 4**

Breakfast & dinner

Rise & shine Boston! We'll start our Boston day today with a visit to learn about some key Boston history that paved the way for our country. First stop Harvard!

**Harvard University Campus Tour** – Dive deep into the rich legends of Harvard's past and discover what makes this school and its students so unique. Tour stops include the Old Yard, Johnston Gate, The John Harvard Statue, Widener Library, Harvard Square Village (student housing), Science Center, Memorial Hall and the Harvard Shop.



**Boston Tea Party** – Join Samuel Adams and the Sons and Daughters of Liberty as they protest the King's unjust taxes. Enjoy the re-enactment of the historic town meeting held just hours before the Boston Tea Party. Storm down to Griffin's Wharf and board one of the authentic replica vessels casting off the yoke of tyranny as you throw the Crown's tea into Boston Harbor. Learn about life at sea, funny anecdotes, and the strange weather conditions facing the Sons of Liberty. Follow the Sons and Daughters of Liberty as they make their escape from the wharf and discover the last remaining tea crate from the Boston Tea Party which washed up on shore the morning after.

Next, we'll jump back into the past as we set off to learn and explore Boston's Freedom Trail.

**Freedom Trail Tour** – Dive deep into Boston's rich history and enjoy stories about America's Founding Fathers and the historic landmarks on the Freedom Trail. Tour stops include Boston Common, The State House, Park Street Church, Granary Burying Ground, King's Chapel, Old City Hall, Old South Meeting House, Irish Famine Memorial, Old Corner Book Store, New City Hall, Old State House, Faneuil Hall and Quincy Market.



This evening we'll have dinner locally and then get to enjoy the marketplace!



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**Quincy Hall and Faneuil Marketplace** - The seat of American history and the site of one of America's most famous shopping and dining experiences is Faneuil Hall Marketplace. For over 250 years, the marketplace has played an integral role in the life of Boston's residents so when you are ready to see, taste, and touch a true Boston experience, you'll adore the historic and exciting Faneuil Hall Marketplace.

Sprawling on 6.5 acres and located in the heart of downtown Boston, directly across the street from Boston's waterfront, this area combines the glories of the past and the vitality of the present with shops, pushcarts, eateries and more. A blend of Neoclassic and Greek revival architecture, the complex is a beautiful representation of old Boston comprised of three restored 19th century buildings with tastefully enhanced urban contemporary additions. Ethnic foods, unique gifts and street performers are just a few elements that make the cobblestone streets such a festive and special place.



### **Day 5**

Breakfast & dinner

Good morning Boston! After breakfast at our hotel, we'll transfer to Guild Hall for some MakerSpace time.

**Guild Hall Makerspace Workshop / Guided Project** – Meet the team at Guild Hall for a morning of creative STEM. There are no cookie cutter projects here, each program is designed to challenge students to explore and create their own vision while being guided by experienced teachers and mentors. Students are presented with situations where they don't have all the information and are allowed the freedom and flexibility to discover their own problems. Real engineers and artists rarely get the answer before the test and this teaches students how to navigate the unknown, formulate useful questions, and arrive at their own solutions.



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For our last afternoon, we'll get to visit the Boston Museum of Science and the Charles Hayden Planetarium.

***Boston's Museum of Science with IMAX & Planetarium*** - Long respected as a leader in science education, the Museum of Science promotes thoughtful participation in today's increasingly technological society. With over 700 permanent exhibits, and an ever-changing cavalcade of touring exhibits, films, and shows, groups can encounter the fresh and unfamiliar, ask questions, and actively address the provocative issues raised by innovations in science and technology.

Spend the morning checking out interesting items and experiments! Your group will receive standard museum admission but please be aware that an **IMAX** presentation and **Planetarium** experience are also included.



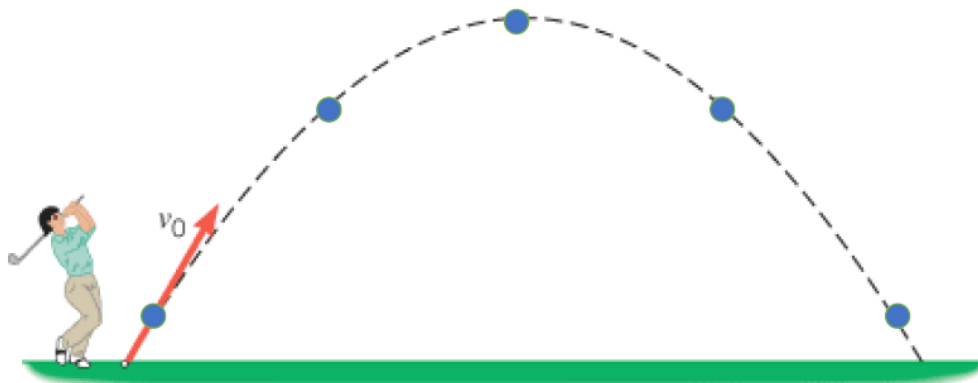
This evening we'll have our farewell dinner and get packed up for tomorrow's departure day.

### **Day 6**

Breakfast (dependent upon departure time)

Good morning Boston! After breakfast in our hotel we'll start our last morning of adventure. This is a special day as we discover the physics of golf!

***Top Golf + "Top Physics" Projectile Motion Learning Lab*** – Top Golf is a sports entertainment complex that features an inclusive, high-tech golf game, climate-controlled hitting bays and music. Whether you're an aspiring golf pro or picking up a club for the first time, Topgolf is fun for all! Groups will enjoy 2-hours of club time with a golf pro circulating among the students. Groups will be issued a Physics "Projectile Motion" worksheet to complete and time to work through your answers with your teaching team and help from the Golf Pro. Game On!



After our exciting golf experience, we'll say goodbye to Boston, waving to our new friends and hopefully, taking away memories that will last a lifetime! If you have extra time, please allow us to assist you in customizing your experience.

## Farewell Boston!

Other areas of interest may include:

[Bunker Hill Monument](#)  
[Edward M. Kennedy Institute for the U.S. Senate](#)  
[Harvard Museum of Natural History Master Class](#)  
[John F Kennedy Presidential Library & Museum](#)  
[Museum of Medical History and Innovation at Massachusetts General Hospital](#)  
[Old Town Trolley Tour](#)  
[Plimoth Plantation](#) (1+-hour from Boston)  
[Salem Witch Museum](#)  
[The New England Aquarium](#)  
[USS Constitution Museum](#) (Old Ironsides Frigate)  
[Whale Watching Tour with a Naturalist](#)



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# PHYSICS, PARTICLES & PROGRESS

## BOSTON, MASSACHUSETTS

**Minimum Booking Numbers:** 20 students

**What's Included:**

- Roundtrip flights or motorcoach transfers
- 5-nights' accommodation in the Boston metro area
- Breakfasts and dinners daily starting with dinner on arrival and ending with breakfast on departure (dependent upon departure time)
- Airport transfers and transportation as shown
- Harvard Physics Master Class at Mazur Labs
- Harvard Museum of Natural History
- Peabody Museum of Archaeology & Ethnology
- University of Massachusetts Lowell & Radiation Safety / Physics Tour
- Boston Harbor Dinner Cruise
- MIT Nuclear Reactor Tour
- MIT Campus Tour
- MIT Master Class – Catching Physics in the Act
- Broad Discovery Center
- Bowling Night
- Boston Tea Party Ship Experience
- Harvard University Campus Tour
- Freedom Trail Walking Tour
- Quincy Market & Faneuil Hall
- Guild Hall Makerspace Workshop
- Boston Museum of Science with IMAX & Hayden Planetarium
- Top Golf Experience + Physics “Projectile Motion” Learning Lab
- Personal Tour Director
- 24-hour emergency cover

**What's Not Included:**

- Fully comprehensive insurance (**mandatory**)
- Transfers to/from home airport
- Baggage costs, pay directly to airline if required
- Baggage handling - everyone should be able to pull / load their own bag
- Transportation for activities not shown in the itinerary
- Lunches or snacks
- Meals other than ones provided for the entire group (we are generally able to cater for allergy conditions and vegetarians only)
- Cost of personal passports, visas or visa waiver fees
- Cost of inoculations or medication required for travel
- Sightseeing / Entertainment options not shown in itinerary
- Hotel incidental deposits & bills – mini-bar, movies, etc.
- Gratuities – drivers, hotel services, area guides, tour director
- Credit card fees if individuals wish to pay via credit card instead of ACH
- Additional taxes, fuel surcharges or charges levied by governments

As always, our staff are always available to you to answer any questions you may have regarding programming. If we may serve you in any way, please do not hesitate to contact us.



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