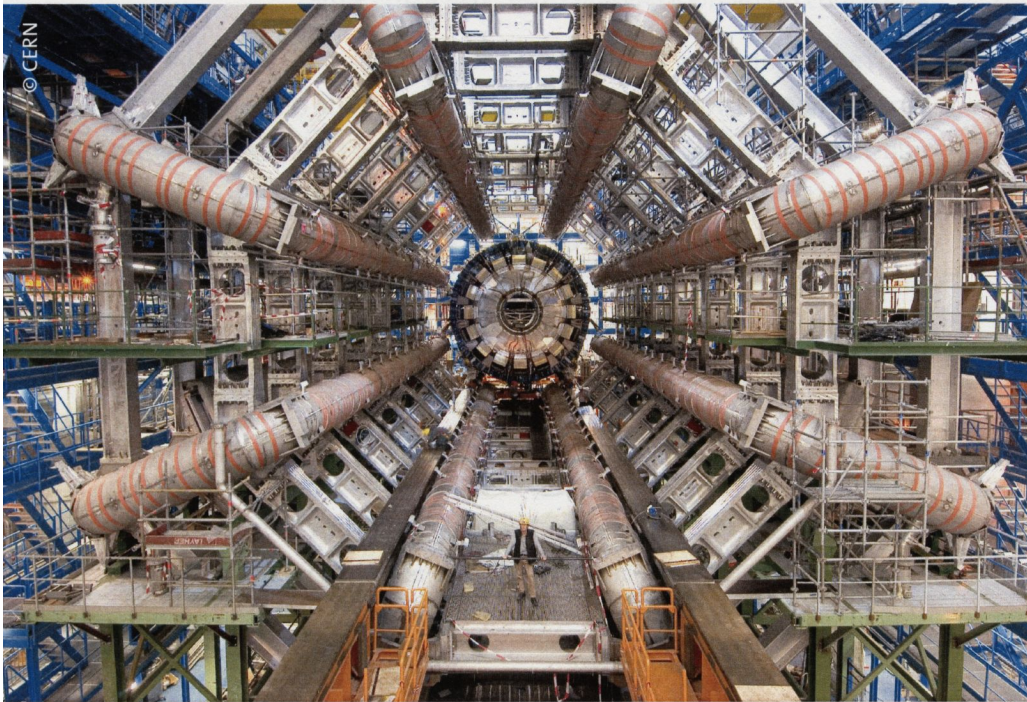


 AMERICAN MUSEUM OF NATURAL HISTORY

# HAYDEN PLANETARIUM ANNUAL ISAAC ASIMOV MEMORIAL DEBATE

## Faster Than the Speed of Light

Tuesday, March 20, 2012  
Samuel J. and Ethel LeFrak Theater



CERN's Large Hadron Collider,  
the world's largest particle accelerator

# Faster Than the Speed of Light

## **Einstein on Trial: Testing Relativity**

Einstein's Theory of Special Relativity has been tested with ever-increasing precision since its publication in 1905. One of its key predictions is that only light itself can travel at the speed of light. Any particles moving faster must be traveling backward in time. Einstein's Theory of General Relativity makes even more audacious predictions about curved space and time.

Two recent papers by a large consortium of physicists using the world's most powerful accelerator are claiming the discovery of neutrinos moving at speeds slightly in excess of the speed of light. Sensitive tests of spacetime curvature and dragging are made possible by state-of-the-art telescopes and satellites. Einstein might be wrong. Our understanding of space, time, mass, and energy all hang in the balance until we know if, or how, relativity theory fails.

This year's Isaac Asimov Memorial Debate will pit some of the experimentalists who claim to have discovered faster-than-light neutrinos against their strongest critics, as well as other teams who are racing to test relativity with unprecedented precision.

PROGRAM

Welcome and Introduction

Opening Questions

Directed Debate Among Panelists

Questions from Audience

Adjournment

Book/Program Signing  
*in the Hall of Northwest Coast Indians*

## Panelists *in the Speed of Light*

**David Cline** is a professor of physics at UCLA and the spokesperson for the first large neutrino experiment at Fermilab, in which weak neutral currents and evidence for charm particles were observed. Along with Carlo Rubbia and Peter McIntyre, he invented the proton and antiproton collider in 1976 that led to the discovery of the W and Z particles in 1983. Cline also helped invent the liquid argon time projection chamber ICARUS and was a member of the team that invented the Compact Muon Solenoid LHC detector at CERN.

**Gian Giudice** is a theoretical particle physicist based at CERN. After obtaining his Ph.D. from the International School for Advanced Studies in Trieste, Italy, he worked at the Fermilab and at the University of Texas. His research focuses on supersymmetry, extra dimensions, and the construction of new theories beyond the Standard Model of particle interactions. He is the author of *A Zeptospace Odyssey*, a popular-science book on the physics of the Large Hadron Collider.

**Sheldon Glashow** is an American theoretical physicist who received the Nobel Prize for Physics in 1979 for his efforts in forming the electroweak theory, which explains the unity of electromagnetism and the weak force. The son of Jewish immigrants from Russia, Glashow earned his Ph.D. from Harvard University. Apart from his electroweak theory, Glashow is a notable skeptic of superstring theory.

**Christopher J. Hegarty** is engineering director with The MITRE Corporation, a not-for-profit organization chartered to work in the public interest. His work focuses on modernization and aviation applications of the Global Positioning System. In 2008, he served as president of the Institute of Navigation. Hegarty is the co-author of the textbook *Understanding GPS: Principles and Applications, 2nd Edition*, co-editor of Artech House's GNSS Technology and Applications Series, and a fellow of the Institute of Navigation and the Institute of Electrical and Electronics Engineers.

## Upcoming Hayden Planetarium Programs

**Laura Patrizii** is a senior researcher at the Italian Nuclear Physics Institute, member of the OPERA Collaboration at the Gran Sasso Laboratory, and group leader at the INFN in Bologna, Italy. She is former member of the MACRO experiment, which participated in the discovery of atmospheric muon neutrino oscillations, and spokesperson of the SLIM experiment at Chacaltaya, Bolivia, which searched for magnetic monopoles in the cosmic radiation. Patrizii is a former member of the INFN Scientific Committee for Neutrino and Astroparticle Physics.

**Gabriela Gonzalez** is a professor of Physics and Astronomy at Louisiana State University. Her research interest is in the detection of gravitational waves with interferometric detectors, such as the one in the LIGO Livingston Observatory, in Livingston, LA. Her group is very involved in the instrumental characterization and calibration of the data collected in the data-taking Science Runs performed by the LIGO Scientific Collaboration (LSC). From 2000 to 2007, she co-lead one of the four data analysis groups in the Collaboration, dedicated to the search of gravitational waves generated by binary systems of compact objects (neutron stars or black holes) in the final inspiraling stage before coalescence.

### HOST AND MODERATOR

**Neil deGrasse Tyson** is an astrophysicist with the Museum, where he also serves as the Frederick P. Rose Director of the Hayden Planetarium. Born and raised in New York City, Tyson attended the Bronx High School of Science and later earned his B.A. in Physics from Harvard and his Ph.D. in Astrophysics from Columbia. He has been an advisor to NASA and to three U.S. Presidents on matters related to space exploration. Tyson has been awarded 16 honorary doctorates, has an asteroid, 13123 Tyson, named after him, and is frequently consulted by print and broadcast media for his views on cosmic discovery. In addition to professional publications, Tyson has written 10 books, the most recent of which is *Space Chronicles: Facing the Ultimate Frontier* (2012).

## Panelists

The late Dr. Isaac Asimov, one of the most prolific and influential authors of our time, was a dear friend and supporter of the American Museum of Natural History.

In his memory, the Hayden Planetarium is honored to host the annual Isaac Asimov Memorial Debate, generously endowed by relatives, friends, and admirers of Isaac Asimov and his work, bringing the finest minds in the world to the Museum each year to debate pressing questions on the frontier of scientific discovery.

Proceeds from ticket sales of the Isaac Asimov Memorial Debates benefit the scientific and educational programs of the Hayden Planetarium.

### **PREVIOUS DEBATES**

- 2011** The Theory of Everything...Still Searching?
- 2010** Rose Center 10th Anniversary Asimov Debate: Is Earth Unique?
- 2010** Moon, Mars, and Beyond: Where Next for the Manned Space Program?
- 2009** From Planets to Plutoids
- 2008** Mining the Sky
- 2007** The Pioneer Anomaly
- 2006** Universe: One or Many?
- 2005** The Enigma of Alien Solar Systems
- 2004** The Dark Side
- 2003** The Big Bang
- 2002** The Search for Life in the Universe
- 2001** The Theory of Everything

## Upcoming Hayden Planetarium Programs

### **Astronomy Live**

6:30 pm | Hayden Planetarium Space Theater

\$15 (\$13.50 Members, students, and seniors)

Spring season pass, 3 for \$40

*This monthly program offers an interactive tour of the universe and a view of the constantly changing night sky. Learn about what is visible in our nighttime sky with the brilliant stars of the Zeiss Mark IX star projector or travel to the edge of the observable universe with the world's largest cosmic atlas, assembled at the Hayden Planetarium. Please see monthly descriptions for details.*

### **Spring Skies: Venus and Jupiter Conjunction and Telescope Party**

Tuesday, March 27

This March, Venus and Jupiter form a brilliant duo in the western evening sky. On March 13, these planets will be in conjunction, with just three angular degrees of separation, and on March 27, a lovely crescent moon will join them. Astronomer **Steve Beyer** will serve as your guide to these visual treats in the Hayden Planetarium Dome. Weather permitting, the viewing will move outdoors for a **Telescope Party** on the Arthur Ross Terrace co-hosted by the **Amateur Astronomers Association**.

### **Unseen Universe**

Tuesday, April 24

Beyond the thousands of stars you can see in the night sky lies an unseen universe. Using the Digital Universe Atlas, Museum research scientists **Emily Rice** and **Jackie Faherty** will show you distant, violent black holes, gases glowing just beyond our eyes' perception, and other elements in the unseen universe.

### **Around the World in 60 Minutes**

Tuesday, May 29

Join **Joe Rao** and astrophysics educator **Christina Pease** to view the sky as it appears in different parts of the world using the Hayden Planetarium's Zeiss Mark IX star projector. Travel to polar regions and watch the midnight Sun effect, head south of the equator to see inverted star patterns and an upside-down Moon, and return home to the familiar New York City sky.

## Upcoming Hayden Planetarium Programs

### **Frontiers in Astrophysics Lecture Series**

7:30 pm | Hayden Planetarium

\$15 (\$13.50 Members, students, seniors)

*Our Frontiers in Astrophysics Lecture Series brings you the latest advances in our knowledge of the universe by hosting astrophysicists working at the cutting edge of this field.*

### **Asteroids: Friends or Foes?**

Monday, April 16

An important legacy of the space age is the realization that impacts by asteroids and comets pose a hazard to civilization on Earth. In this talk, professor **Richard Binzel** will examine whether there is cause for serious concern, the possibility of exploring asteroids for resources, and the potential role of asteroids in future interplanetary space travel.

### **The Birth and Death of Stars**

Monday, May 14

Join MIT Professor Emeritus **Walter Lewin** to learn about the “death” of stars and the history and discovery of white dwarfs, neutron stars, and stellar-mass black holes. Lewin will also demonstrate the Doppler shift, a crucial concept in astrophysics.

### **Dark Energy and the Runaway Universe**

Monday, June 18

The expansion of the universe, once thought to be slowing down, is now believed to be speeding up under the force of a repulsive “dark energy.” Join astronomer **Alex Filippenko** to learn how he uses distant exploding stars to study dark energy and its creation of a runaway universe.



## Special Events in the Hayden Planetarium

### **Spaceship Earth**

Thursday, April 19

6:30 pm | Hayden Planetarium Space Theater

\$15 (\$13.50 Members, students, and seniors)

Celebrate Earth Day 2012 with our annual appreciation of Earth as seen from space. With Museum Director of Astrovisualization **Carter Emmart** as your guide, drift over the blue planet and see it faithfully visualized with satellite data accompanied by a live ambient soundscape.

### **Starball**

FAMILY PROGRAM

Saturday, June 9

6 pm | Hayden Planetarium Space Theater

\$12

See the stars in a new, more personal way in this interactive program in the Hayden Planetarium dome. Theatrical professionals use audience members' dreams to create new constellations in the night sky as part of an entertaining mix of astronomy, music, improv, and singing. Visitors of all ages and backgrounds are encouraged to join in the fun.



Learn more about Hayden Planetarium Programs  
at [haydenplanetarium.org](http://haydenplanetarium.org) or (212) 769-5100.

Information about tickets and other programs,  
[amnh.org](http://amnh.org) or (212) 769-5200

Department of Astrophysics  
[research.amnh.org/astrophysics](http://research.amnh.org/astrophysics)

Rose Center for Earth and Space  
[amnh.org/calendar](http://amnh.org/calendar) or (212) 769-5900

Hayden Planetarium's Night Sky Q&A Hotline  
(212) 769-5901

To add your name to the Hayden Planetarium's StarStruck  
e-mail list and to receive updates on sky phenomena and  
Hayden Planetarium events, visit [amnh.org/email](http://amnh.org/email).