



AMERICAN MUSEUM OF NATURAL HISTORY

**HAYDEN PLANETARIUM  
ISAAC ASIMOV  
MEMORIAL DEBATE**

**Is the  
Universe a  
Simulation?**

TUESDAY

4.05.16

AT

7 PM

SAMUEL J. AND ETHEL LEFRAK THEATER

#asimovdebate



## ABOUT THE DEBATE

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 ASIMOV DEBATES

- 2015 | Water, Water
- 2014 | Selling Space
- 2013 | The Existence of Nothing
- 2012 | Faster than the Speed of Light
- 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



HAYDEN PLANETARIUM  
2016 ISAAC ASIMOV MEMORIAL DEBATE  
**Is the Universe a Simulation?**

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**TONIGHT'S PROGRAM**

Welcome and Introduction

Opening Questions

Directed Free Debate Among Panelists

Questions from Audience

Adjournment

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**ABOUT THE TOPIC**

What may have started as a science fiction speculation—that perhaps the universe as we know it is a computer simulation—has become a serious line of theoretical and experimental investigation among physicists, astrophysicists, and philosophers.

Join host and moderator **Neil deGrasse Tyson** and his panel of experts for a lively discussion and debate about the merits and shortcomings of this provocative and revolutionary idea.

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## PANELISTS

**David Chalmers** is University Professor of Philosophy and co-director of the Center for Mind, Brain, and Consciousness at New York University. He is the author of *The Conscious Mind: In Search of a Fundamental Theory* and *Constructing the World* and is well-known for his work in the philosophy of mind and in related areas of philosophy and cognitive science. As a founder of the Association for the Scientific Study of Consciousness, he has played a major role in developing the interdisciplinary science of consciousness. He has also written on topics as diverse as the nature of meaning, the foundations of artificial intelligence, and philosophical issues in *The Matrix*.

**Zohreh Davoudi** is a post-doctoral research associate at Massachusetts Institute of Technology's Center for Theoretical Physics. She received her Ph.D. degree in physics from the University of Washington in 2014. She studies complex systems of atomic nuclei from the perspective of fundamental interactions of the Standard Model of particle physics, through the method of lattice quantum chromodynamics (LQCD), which she calls a precursor to the science of simulating the universe. In particular, she and her collaborators have investigated some of the signatures of a potential simulated universe, assuming it resembles the mini-simulations of nature as performed by LQCD physicists.

**Sylvester James Gates** is an American theoretical physicist. Dr. Gates is currently a University System Regents Professor and the John S. Toll Professor of Physics at the University of Maryland, College Park; he is also the director of the String and Particle Theory Center, and affiliate professor of mathematics; and a member of the U.S. President's Council of Advisors on Science and Technology, the National Commission on Forensic Science, and the Maryland State Board of Education. He is known for his work on supersymmetry, supergravity, and superstring theory. President Obama awarded Gates the National Medal of Science, the highest award given to scientists in the U.S., at a White House ceremony in 2013. During 2014, he was named the Harvard Foundation's "Scientist of the Year."

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**Lisa Randall** studies theoretical particle physics and cosmology at Harvard University. Her research connects theoretical insights addressing puzzles in our understanding of the properties of matter, the universe, and space. Dr. Randall’s current focus is on dark matter. Her latest book *Dark Matter and the Dinosaurs* is a sweeping overview of the evolution of the universe, the Milky Way, the solar system, and life. Randall’s books *Warped Passages* (2005) and *Knocking on Heaven’s Door* (2011) were featured on *The New York Times*’s lists of “100 Notable Books.” Randall’s studies have made her among the most-cited and influential theoretical physicists.

**Max Tegmark** is a professor at the Massachusetts Institute of Technology, the scientific director of the Foundational Questions Institute, and the president of the Future of Life Institute. Known as “Mad Max” for his unorthodox ideas and passion for adventure, Dr. Tegmark’s scientific interests range from the physics of cognitive systems to precision cosmology to the ultimate nature of reality, all explored in his popular book *Our Mathematical Universe*. He has published more than 200 technical papers and has been featured in dozens of science documentaries. His work with the Sloan Digital Sky Survey on galaxy clustering shared the first prize in *Science* magazine’s “Breakthrough of the Year: 2003.”

**HOST AND MODERATOR**

**Dr. Neil deGrasse Tyson** is an astrophysicist with the American Museum of Natural History and the Frederick P. Rose Director of the Hayden Planetarium.

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**FRONTIERS LECTURE SERIES**

The Frontiers Lectures highlight the latest advances in our knowledge of the universe by presenting the work of scientists working at the cutting edge of astrophysics.

**Gravitational Waves: Messengers from the Warped Universe**

**Monday, April 18 | 7:30 pm | Hayden Planetarium**  
**\$15, \$12 Members, \$13.50 seniors/students**

Some of the most violent events in the universe warp space-time and create gravitational waves. Physicist **Nergis Mavalvala** discusses how we search for these ripples in space-time and decode the information they carry about events as far back as the first moments after the Big Bang.

**Our Place in the Universe**

**Monday, May 9 | 7:30 pm | Hayden Planetarium**  
**\$15, \$12 Members, \$13.50 seniors/students**

What is our place in the universe? Since the time of Galileo, our understanding of this fundamental question has been overthrown again and again as telescopes have evolved. Join astronomer **Jason Kalirai** on a journey through space to uncover the latest evidence about where we sit in the universe and explore the possibility of life on other worlds.

**Coloring the Universe**

**Monday, June 13 | 7:30 pm | Hayden Planetarium**  
**\$15, \$12 Members, \$13.50 seniors/students**

The data collected using giant telescopes is meant for scientific research, but it can also be presented as images of incredible beauty. Astrophysicist **Travis Rector** will explain how researchers create images that are both aesthetically pleasing and scientifically useful, while the Museum's director of Astrovisualization **Carter Emmart** will project examples of this stunning imagery in the full dome.





## ASTRONOMY LIVE

The Hayden Planetarium has assembled the world's largest cosmic atlas, extending from Earth to the edges of the observable universe. Combined with the brilliant stars of the Zeiss Mark IX star projector, these programs offer an interactive tour of the universe and a view of the constantly changing night sky.

### The Force Fields Around Spaceship Earth

**Tuesday, April 26 | 7 pm | Hayden Planetarium**  
**\$15, \$12 Members, \$13.50 seniors/students**

Discover the invisible force fields all around us that make life on Earth possible. Join **Jana Grcevich** and **Irene Pease** as they explore the various dangers of space that could destroy us, and how Earth's magnetic and gravitational fields keep us safe.

### Opposition of Mars

**Tuesday, May 31 | 7 pm | Hayden Planetarium**  
**\$15, \$12 Members, \$13.50 seniors/students**

In the coming months, Mars will be easily visible in the night sky. Join **Steven Beyer** and **Joe Rao** as they illustrate Mars' place among the stars of the constellation Scorpius and explain what happens during the Opposition of Mars, when the Red Planet and the Sun are on opposite sides of Earth. The hosts will also share updates and discoveries from recent Mars missions.

### Unsolved Mysteries of the Universe

**Tuesday, June 8 | 7 pm | Hayden Planetarium**  
**\$15, \$12 Members, \$13.50 seniors/students**

Are we alone in the cosmos? What happened in the early universe? What are dark matter and dark energy? The universe holds many secrets—some of which scientists may be on the verge of uncovering, and others that may remain hidden for a long time to come. **Jackie Faherty** and **Jana Grcevich** explore some of the most important unsolved mysteries of astronomy and cosmology, and how scientists seek to solve them.



## SPECIAL EVENT

### From the Big Bang to the Multiverse and Beyond

Thursday, May 5 | 8:30 pm | Hayden Planetarium | \$10

We know the universe began 13.7 billion years ago in an event called the Big Bang, but many questions remain. Is our universe part of a larger multiverse? What is causing the accelerating expansion of the cosmos? These are the mysteries that inspire cosmologists today. In a dazzling, full-dome presentation simulcast from the Adler Planetarium astrophysicist **Michael Turner** will illustrate what we know and how we know it, as well as the big ideas and puzzles of cosmology today.

*This program is presented live from the Adler Planetarium in Chicago with local host **Carter Emmart**, director of astrovisualization.*

## HAYDEN PLANETARIUM PROGRAMS

Visit [amnh.org/calendar](http://amnh.org/calendar) or call 212-769-5200 for program and ticket information.

## NIGHT SKY Q&A HOTLINE

Call the Hayden Planetarium at 212-769-5901 with your astronomy questions.

## STARSTRUCK EMAIL NEWSLETTER

Sign up for occasional emails about sky phenomena and upcoming Hayden programs at [amnh.org/email](http://amnh.org/email).

## HAYDEN PLANETARIUM

Explore the frontier of astrophysical research at [haydenplanetarium.org](http://haydenplanetarium.org).

## DEPARTMENT OF ASTROPHYSICS

Learn about current astrophysical research at [research.amnh.org/astrophysics](http://research.amnh.org/astrophysics).

## ROSE CENTER FOR EARTH AND SPACE

Explore the cosmos, stars, galaxies, and planets at [amnh.org/rose](http://amnh.org/rose) or call 212-769-5900.

*Support for Hayden Planetarium Programs is provided by the Schaffner Family and the Horace W. Goldsmith Endowment Fund.*