

For information on the composers, works, and artists, please see the program notes for the concert of November 17, 2016.

# The Planets: LIVE!

## An Out-of-this-World Partnership

In the opening movement of Gustav Holst's famous symphonic suite *The Planets*, powerful, driving rhythms and dramatic dynamic swells depict Mars as "The Bringer of War." Concertgoers at the North Carolina Symphony's *The Planets: LIVE!* will not only hear Holst's portrayal of Mars, but will see some of the wonders of the red planet in incredible images produced from NASA missions—from sand dunes, to dark streaks in the Hale Crater that evidence the seasonal flow of water, to a "selfie" taken by the robotic arm of the Curiosity rover. Similarly, in "Saturn, The Bringer of Old Age," as the timpani strikes become more and more insistent and then give way to a peaceful harp melody, breathtaking images of Saturn's rings will fill the big screen.

The North Carolina Symphony has a longstanding belief that collaborations with other cultural and educational organizations create arts experiences greater than the sum of our parts. After forging a new partnership with the North Carolina Museum of Natural Sciences last spring for a performance of Vivaldi's *Four Seasons* with projected images and aerial footage of North Carolina state parks, NCS is thrilled to work again with the museum for this special performance of *The Planets* with a montage of imagery and video projected in high-definition.

Roy Campbell, Chief of Exhibitions and Digital Media at the museum, and Rachel Smith, Head of the Astronomy and Astrophysics Research Lab, explain that the stunning still images to be shown at the concert come from several sources connected to the NASA missions sent to explore the planets of the solar system. These include Magellan (Venus), Mars Reconnaissance Orbiter (Mars), the Curiosity rover (Mars), Cassini (Saturn), and Voyager (Jupiter and the outer planets). "Many of these missions continue to transmit amazing images of the inner and outer solar system worlds, expanding our views of fascinating planetary features," says Rachel.

The featured video imagery shows orbital trajectories of the planets and planetary surface "tours," with the Milky Way in the background. These video images were created using innovative

new software called *OpenSpace*, which uses NASA mission and astronomical databases to create state-of-the-art renderings of the planets' coordinate systems, including the latest imaging of their surface features and accurate configurations of background stars at a user-designated date and time. That means that the video images seen by our audience members at *The Planets: LIVE!* will be an exact representation of the positioning of the planets and stars as they exist on that very evening.

"Our partnership with the North Carolina Museum of Natural Sciences provides our community with the opportunity to experience the music of *The Planets* like never before," says Sandi Macdonald, NCS President & CEO. "The breakthrough technology used to capture detailed images of our solar system will make this 100-year-old musical masterpiece even more powerful."

Rachel echoes those sentiments from her viewpoint as an astronomer. "I'm accustomed to visualizing planets and stars in the abstracted form of data from telescopes," she explains. "Working on Holst's *The Planets* with the North Carolina Symphony has enhanced my appreciation of the solar system through an artistic, musical space."

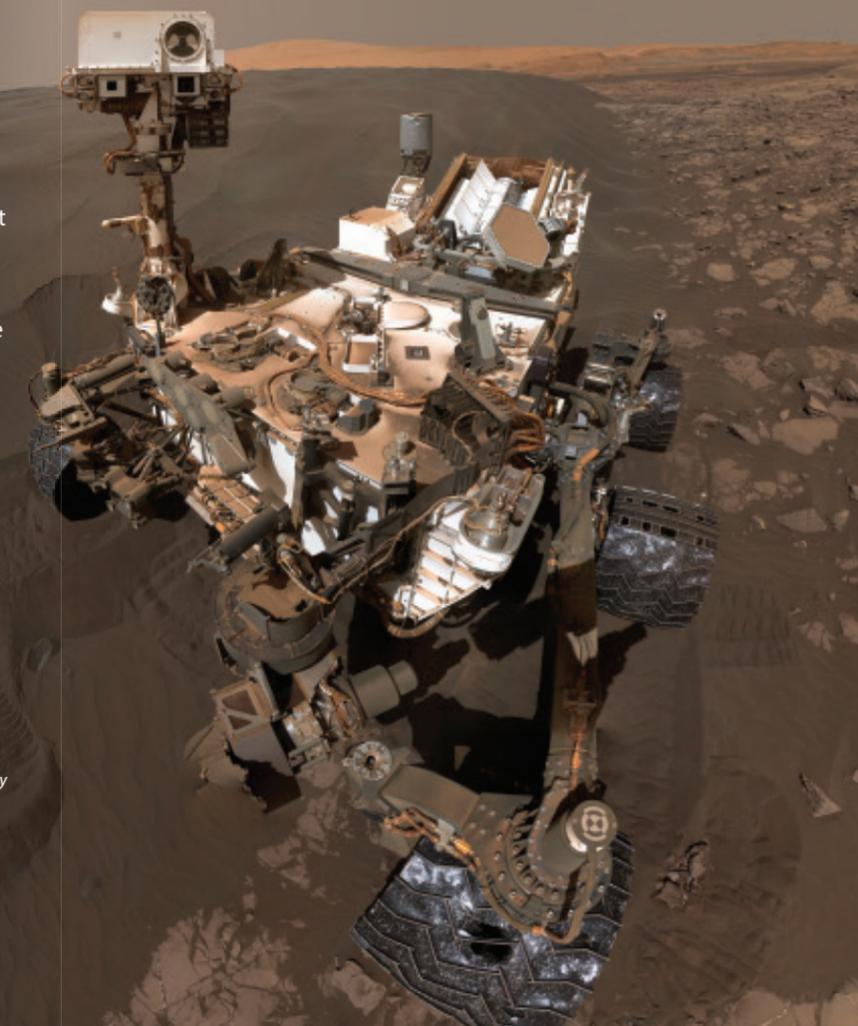
"Working at the intersection of art and science always presents exciting opportunities," Roy agrees. "But exploring those possibilities with Holst's *The Planets* with the North Carolina Symphony is sublime alchemy."

The completed multimedia experience to be presented with Holst's *The Planets* includes the still images and video images from the solar system, combined with live footage of the Symphony's musicians as they perform. When musicians have important solos, for example, audience members will see them up close—which will also help key people in to what to listen for in the music.

NCS Principal Flute Anne Whaley Laney admits that she's a bit jealous of the view of the solar system that concertgoers will have. "I'd like to switch seats with someone in the audience at

**Curiosity self-portrait:** Self-portrait of the Curiosity rover on Mars, at Namib Dune. The camera used for this is the Mars Hand Lens Imager (MAHLI) at the end of the rover's robotic arm. (Note: The robot's arm is not included in this view.)

Image credit: NASA/JPL-Caltech/MSSS



least once every movement, to see the satellite photos of each planet as Holst depicts them musically," she says. I've loved learning about outer space since I was a child—I'd love to meet Neil deGrasse Tyson someday!"

Anne adds that she's "played *The Planets* many times, but it's always a challenge and a thrill." Undoubtedly, this performance will be an especially thrilling one, combining Holst's captivating music—which was based on ancient notions about the characteristics of the planets—with cutting-edge technology.

When the North Carolina Symphony partners with fellow cultural organizations, you benefit with out-of-this-world experiences!

**The North Carolina Symphony and the North Carolina Museum of Natural Sciences present *The Planets: LIVE!* on November 18 and 19 at Meymandi Concert Hall. For tickets and more information, visit [ncsymphony.org](http://ncsymphony.org).**

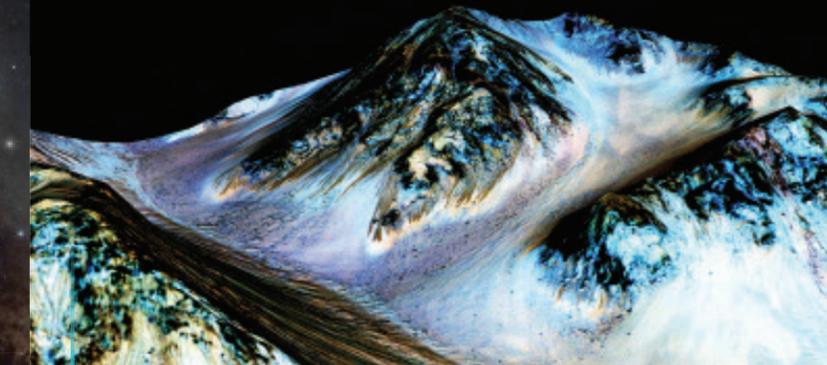
*The OpenSpace project in its current phase is part of a new collaboration between the North Carolina Museum of Natural Sciences and the American Museum of Natural History in New York City.*

*The completed film to be shown with *The Planets* was created by the Digital Media team and Astronomy and Astrophysics research group at the North Carolina Museum of Natural Sciences. This work included significant contributions by undergraduate student interns in astrophysics from Appalachian State University, and student volunteer involvement from North Carolina State University, all working in the Astronomy & Astrophysics Research Lab at NCMNS during the summer of 2016.*



**Mars rendering:** Screen shot from video rendering of Mars with Milky Way in the background, created using *OpenSpace* software.

Image Credit: R. Smith, NC Museum of Natural Sciences/Appalachian State University

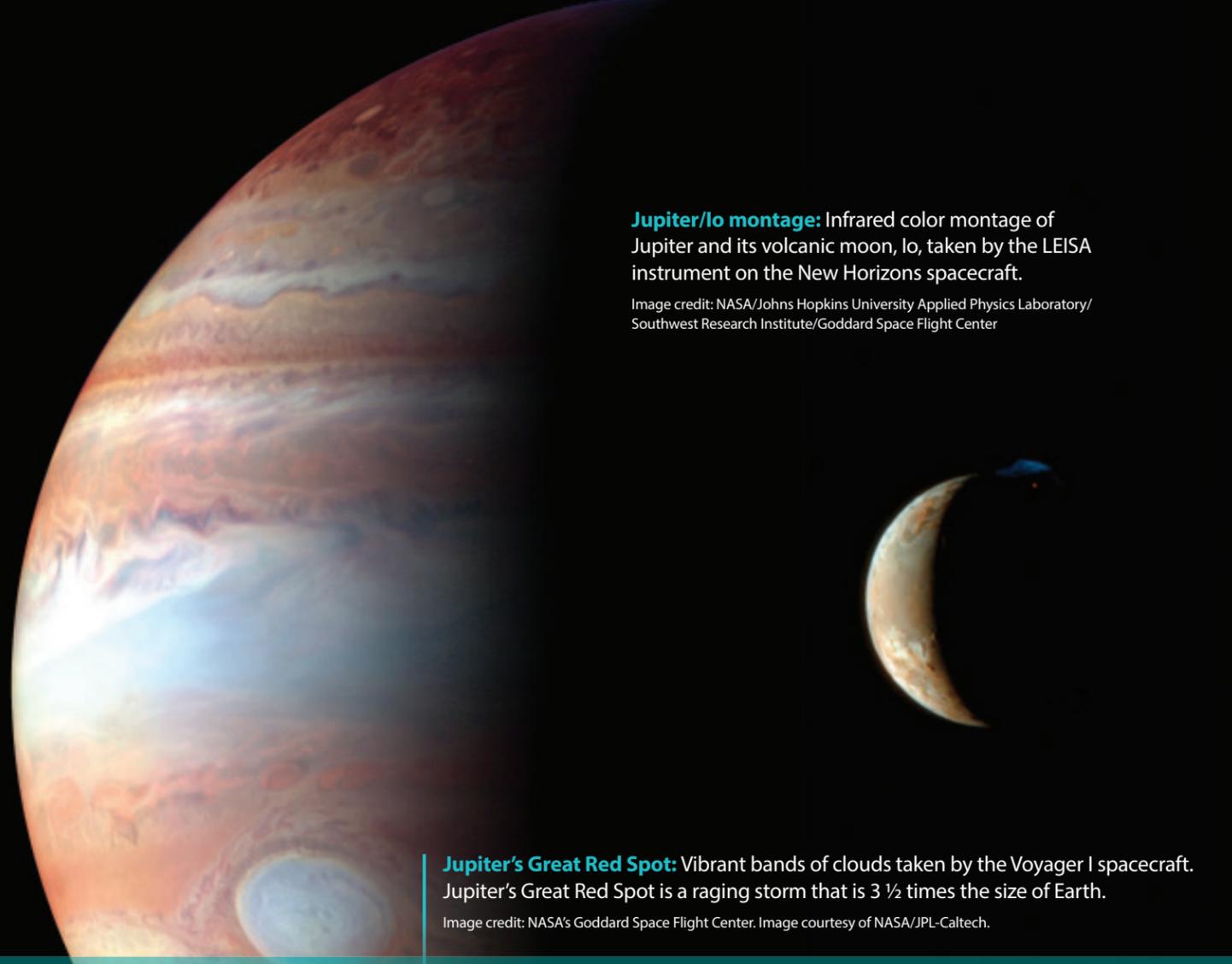


**Evidence for seasonal water flow on Mars:** Dark, narrow streaks in Mars' Hale Crater. This false color image was taken with the HiRISE camera on NASA's Mars Reconnaissance Orbiter.

Image courtesy NASA/JPL-Caltech/Univ. of Arizona

TOP RIGHT: **Solar system orbits:** Screen shot from video rendering of solar system planetary orbits, created using *OpenSpace* software.

Image Credit: R. Smith, North Carolina Museum of Natural Sciences/Appalachian State University

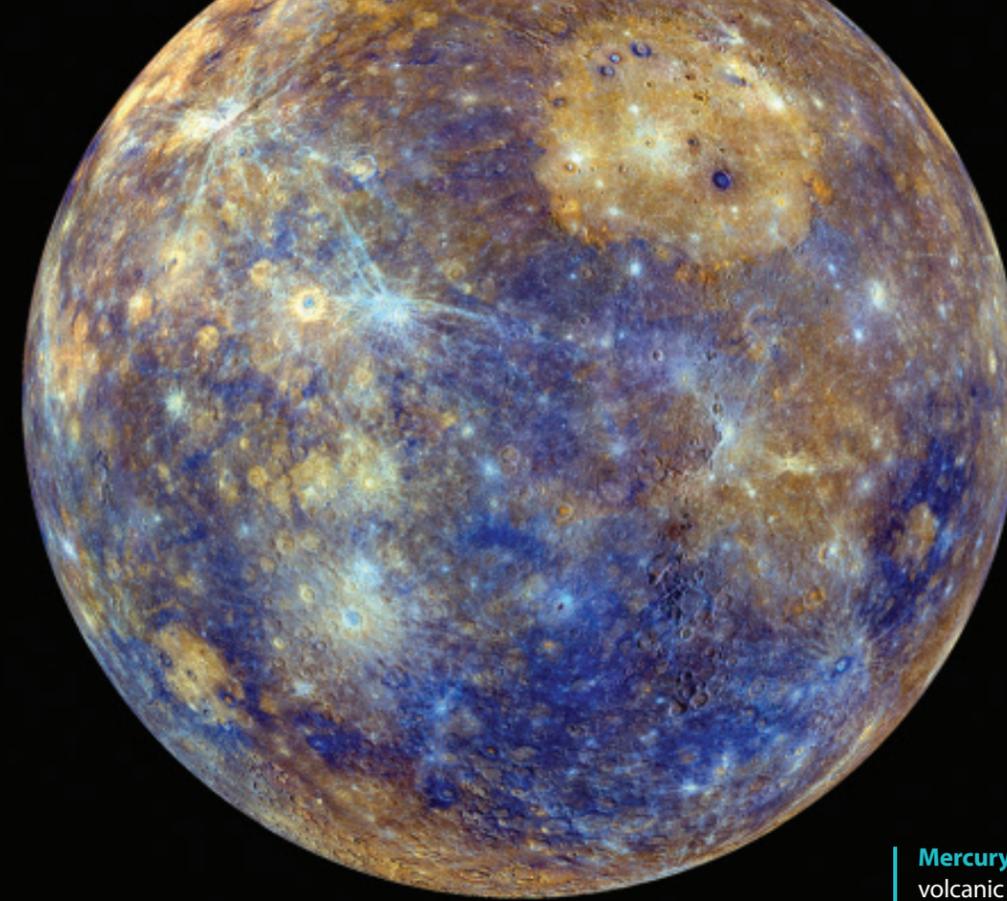


**Jupiter/Io montage:** Infrared color montage of Jupiter and its volcanic moon, Io, taken by the LEISA instrument on the New Horizons spacecraft.

Image credit: NASA/Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute/Goddard Space Flight Center

**Jupiter's Great Red Spot:** Vibrant bands of clouds taken by the Voyager I spacecraft. Jupiter's Great Red Spot is a raging storm that is 3 1/2 times the size of Earth.

Image credit: NASA's Goddard Space Flight Center. Image courtesy of NASA/JPL-Caltech.



**Mercury elevation map:** Map of Mercury taken by the MESSENGER spacecraft. The colors shown enhance the chemical, mineralogical, and physical differences between the rocks that make up Mercury's surface.

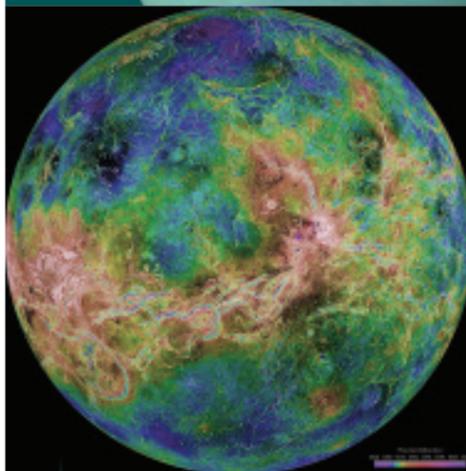
Image credit: NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington

**Saturn's rings:** Radio image of Saturn's rings taken by the Cassini spacecraft. Colors correspond to various sizes of the particles making up the rings.

Image credit: NASA/JPL-Caltech

**Mercury craters:** View of Mercury's northern volcanic plains, with colors emphasizing different rock types. In the bottom right portion of the image, the 181-mile-diameter Mendelssohn impact basin, named after the German composer, appears to have been once nearly filled with lava. Image taken by the MDIS camera on the MESSENGER spacecraft.

Image Credit: NASA/JHUAPL/Carnegie Institution of Washington



**Venus elevation map:**

Hemispheric map of Venus, with colors representing elevation. This radar image was taken by the Magellan spacecraft.

Image credit: NASA/JPL/USGS



**Backlit Saturn:** This backlit image of Saturn was taken by Cassini as the spacecraft slipped behind the planet and photographed it eclipsing the Sun. The Earth-Moon system is seen as a tiny bright dot (lower-right, just below rings).

Image credit: NASA/JPL-Caltech

