Stories about solar eclipse events often start with the wonder or terror experienced by ancient cultures. Ancient cultures often conjured up powerful or mischievous mythical creatures to explain the mysterious darkening of their source of light. Indeed, animal reactions witnessed by these ancient peoples only added embellishment to those stories. Today, we know the physical reason for an eclipse and can predict its date, duration, and path over the Earth with scientific accuracy, yet the excitement associated with

Solar Eclipse Shadow on the Horizon about 20 minutes after the time of the Total Eclipse over the southern Indian Ocean as viewed from the International Space Station (ISS). ISS006-E-5064 was taken by the ISS crew on Dec 04, 2002 at 07:58:12 GMT while the ISS was over 29.8° S, 59.4° E. [Earth Science and Remote Sensing Unit, NASA Johnson Space Center]

Looking Back at the Eclipsed Earth. Taken by French astronaut, Jean-Pierre Haigneré from the Russian MIR 27, Aug 11, 1999. [CNES]
these celestial events has not waned. People continue to journey to total solar eclipse locations to see, experience, photograph, and study them, looking skyward from sometimes exotic locations. The dawn of the space age has provided us with a new vantage point for viewing a solar eclipse. We can now look down rather than up to see and enjoy an eclipse, looking at the Moon's shadow cast on the Earth rather than the traditional view of seeing the Moon pass in front of the Sun.

Astronauts Capture Photos of the Solar Eclipse

Acquiring images of an eclipse from a space vehicle is no small feat. The space vehicle has to be in the correct hemisphere, in daylight conditions, and have a window with a view in the right direction to see the shadow of the solar eclipse. There have been more than a few times when an astronaut has wished that their spacecraft had enough power to change its orbital inclination or better still just magically ignore orbital mechanics to pass over the shadow of the eclipse to capture a rare photograph. During Space Shuttle flights between 1981 and 2000, Shuttle crews did not collect any images of solar eclipses. It wasn’t until the advent of orbiting space stations, particularly the International Space Station (ISS) and its continuous presence in space, where occasionally the station was in the right place at the right time for the crew to photograph the shadow of the eclipse. As early as August 11, 1999, a French astronaut, Jean-Pierre Haigneré, flying aboard the Russian MIR space station (Expedition 27), took a photo of the solar eclipse shadow on that date. At that time no Shuttle was in orbit.
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and no US astronaut was aboard the MIR.

Capturing a photo of a solar eclipse during Space Shuttle missions proved elusive, but Shuttle astronauts like Dr. Ron Parise were very eager to do it, as he had already been involved in helping NASA webcast a total eclipse to people all over the globe. Parise, a Payload Specialist Astronaut, was an astronomer and physicist. He flew on two Shuttle missions (1990, 1995) to operate the Astro ultraviolet observation payload, which he had helped design and construct, and later analyzed the results to better understand the birth, life, and death of stars and galaxies. During the total eclipse on Aug 11, 1999, Dr. Parise was aboard the cruise ship Olympic Countess as the lead for a NASA Sun-Earth educational program. His team tackled the elaborate preparations and provided the satellite transmissions from the decks of the cruise ship so NASA photos and video files of the solar eclipse — as well as the associated shipboard activities — could be webcast to the world in near real time. Astronaut Parise was also an avid amateur radio enthusiast. A popular activity in the “ham” radio community is a special event station, operated in celebration of an unusual or historic event. Dr. Parise had set up a special event station on board the Olympic Countess which connected the ham radio community around the world to the excitement on board the Black Sea eclipse cruise. His operation of a High Frequency (HF) “special event station” from the decks of the Olympic Countess both before and after the eclipse commemorated the celestial event and celebrated the last Solar Eclipse of the 20th Century. This activity aboard the

Samantha Cristoforetti (Italian. Lived on ISS Nov’14-Jun’15)

“Took a peek out the window between experiments. Orbital sunrise and the #SolarEclipse... could it go any better? ... I think this is it: the umbra. Looking aft on our flightpath around maximum obscuration time. #SolarEclipse”

A Mosaic of the Total Solar Eclipse Over Andrasen, Turkey March 29, 2006. [Stefan Seip]

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A Mosaic of the Total Solar Eclipse Over Andrasen, Turkey March 29, 2006. [Stefan Seip]
Olympic Countess by Astronaut Parise served as a prototype for future NASA world-wide educational programs for solar eclipses.

On March 29, 2006, no big city was directly on the 185 kilometer-wide path of totality, but several cities including Ankara [Turkey], Lagos [Nigeria] and Tbilisi [Georgia] were very close to it. For the 2006 Total Eclipse, NASA, conducted another world-wide education program to engage a large audience. For this eclipse, the ISS was in the right place in its orbit so that the crew could share photos of their unique observations with the public.

Getting Information to the Crew
The Earth Science and Remote Sensing group at NASA JSC looks for any overlap of ISS orbital tracks with upcoming solar eclipse paths. If an overlap is found, eclipse information and maps showing the path of totality are included in the daily Earth Observation (CEO) message to the crew the day before the eclipse. Crew members know how to take photos of the eclipse because of their photography training during the year before their flight; the information in the CEO message assists them in knowing in which direction to look, and at what time to start looking and taking photos of the eclipse shadow. The two graphics to the right were sent to the ISS Expedition 12 crew during the March 29, 2006 solar eclipse.

Total Solar Eclipse August 17, 2017; Anticipation is Growing!
Will the August 2017 Total Solar Eclipse over the United States be the most viewed ever? Advanced planning by such organizations as the Astronomical Society of the Pacific and NASA are taking place now to be able to use all of the internet and social media tools available to share the imagery, science, and excitement of this major event. At NASA JSC we are keeping an eye on the ISS’s orbit track predications to see if the Moon’s, Sun’s, and ISS’ paths align so the ISS crew can
acquire images and share them and their excitement with the world. You can see imagery of Earth taken by the astronauts at any time by going to the Gateway to Astronaut Photography of the Earth. See the latest selected Astronaut image and also information about the rest of our Astromaterials Research and Exploration Science (ARES) Division of the Exploration Integration and Science Directorate at NASA JSC on our social media sites: Twitter, Facebook, Instagram, Google +, and WordPress.

Where will you be on August 21, 2017?

About the Author
Susan Runco is the Deputy Manager of the Exploration Science Office within the Exploration Integration and Science Directorate at JSC. She is also a co-principal investigator and science operations lead for the ISS’s High Definition Earth Viewing (HDEV) cameras (imagery can be viewed on USTREAM). In previous positions, she helped train and guide Space Shuttle and ISS crews in Earth observations, which included managing the imagery database and developing software for citizen science involvement. As a naval officer, she also forecasted weather and ocean conditions for air and ship operations.

“It is amazing to see an eclipse from orbit. The shadow on Earth looks just like what you see in the physics books and the astronomy book where those folks figured all that out without ever having seen what that shadow looks like.”

— NASA Astronaut Don Pettit
Resources:
- NASA's Gateway to Astronaut Photography of Earth:
- CNES/J.P. Haignere, 1999: [https://cnes.fr/fr/photo-mystere/eclipse-tache-sombre-terre](https://cnes.fr/fr/photo-mystere/eclipse-tache-sombre-terre)

Save the Date!
Please join us December 8–9, 2016, at the Moonrise Hotel in St. Louis, Missouri, for the ASP’s 128th Annual Meeting, which will be a special STEM outreach conference focused on preparations for the 2017 solar eclipse that will be visible across North America.

[www.astrosociety.org/meeting](http://www.astrosociety.org/meeting)