



10.2 Recent and Future Missions



Let's check your book answers:

Explain

1. What is a goal of future space exploration?

One goal is to extend human space travel in the solar system.

Differentiate

2. What is the purpose of each type of probe?

Solar	Lunar
help scientists understand the hazards of solar radiation	help scientists collect data to determine the best location for a future lunar outpost

Identify

3. What do scientists want to learn about the inner planets?

Scientists want to learn how they formed, what geologic forces are active on them, and whether any of them can support life.

10.2 Recent and Future Missions

Describe

4. Why are missions to the outer planets difficult?

They are difficult because the outer planets are so far from Earth.

Connect

4. Highlight why it is important for scientists to investigate the conditions for life on Earth.

Relate

5. Underline how exploring space can help scientists learn about Earth.

Conditions Needed for Life

Astrobiology is the study of life in the universe, including life on Earth and the possibility of extraterrestrial life. Investigating the conditions for life on Earth helps scientists predict where they might find life elsewhere in the solar system. Astrobiology also can help scientists locate environments in space where humans and other Earth life might be able to survive.

Understanding Earth by Exploring Space

Space provides frontiers for the human spirit of exploration and discovery. The exploration of space also provides insight into planet Earth. Information gathered in space helps scientists understand how the Sun and other bodies in the solar system influence Earth, how Earth formed, and how Earth supports life. Looking for Earthlike planets outside the solar system helps scientists learn if Earth is unique in the universe.

LRO

Lunar Reconnaissance Orbiter



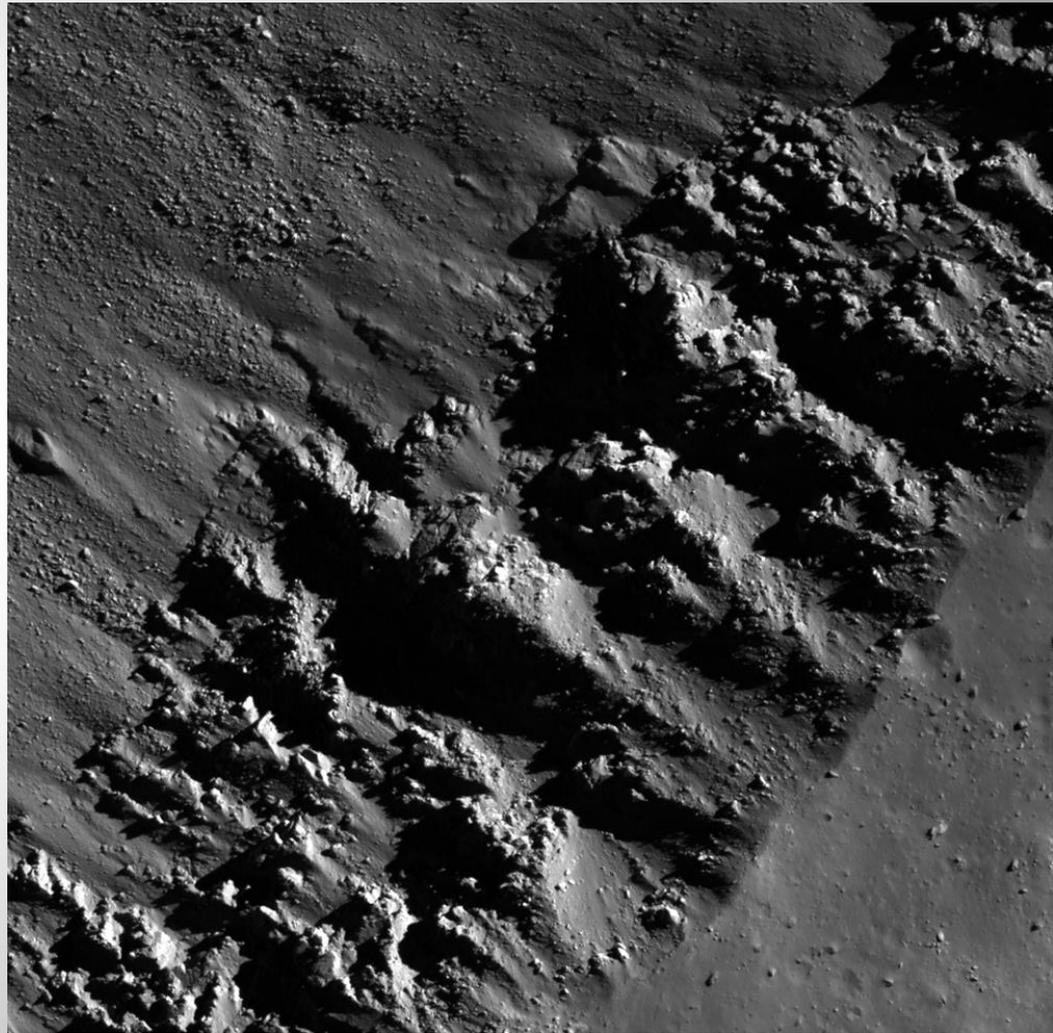
Launch Date: June 18, 2009

Destination: Earth's moon

Reached Moon: June 23, 2009

Type of craft: Orbiter

Intended purpose: to map the surface of the moon like never before

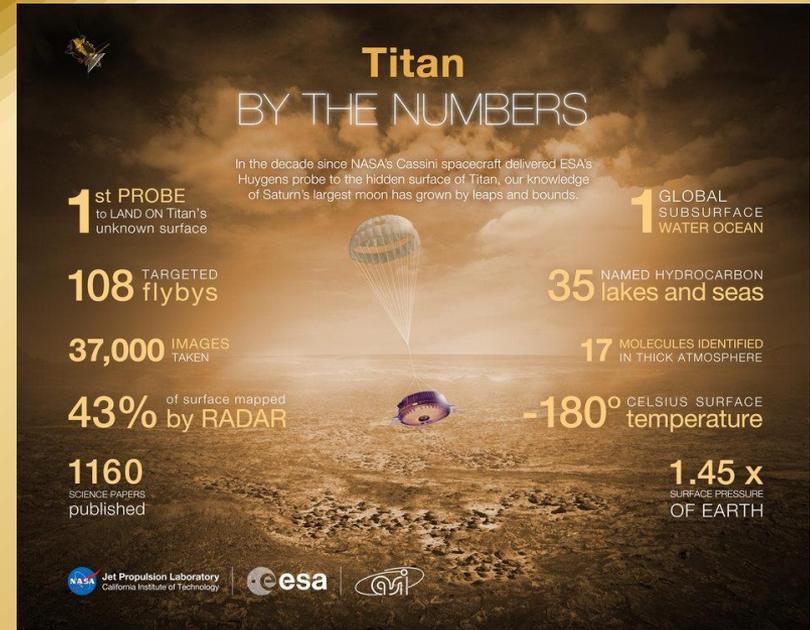
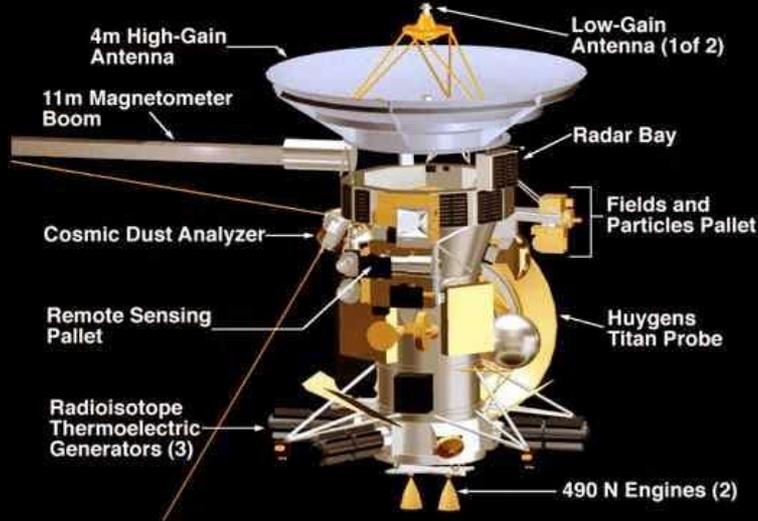


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Cassini-Huygens



CASSINI CRUISE CONFIGURATION



Launch Date: October 15, 1997

End of mission September 2017

Destination: Saturn and its system

Reached Saturn: June 30, 2004

Type of craft:

Cassini = Orbiter around Saturn

Huygens = Lander on Titan

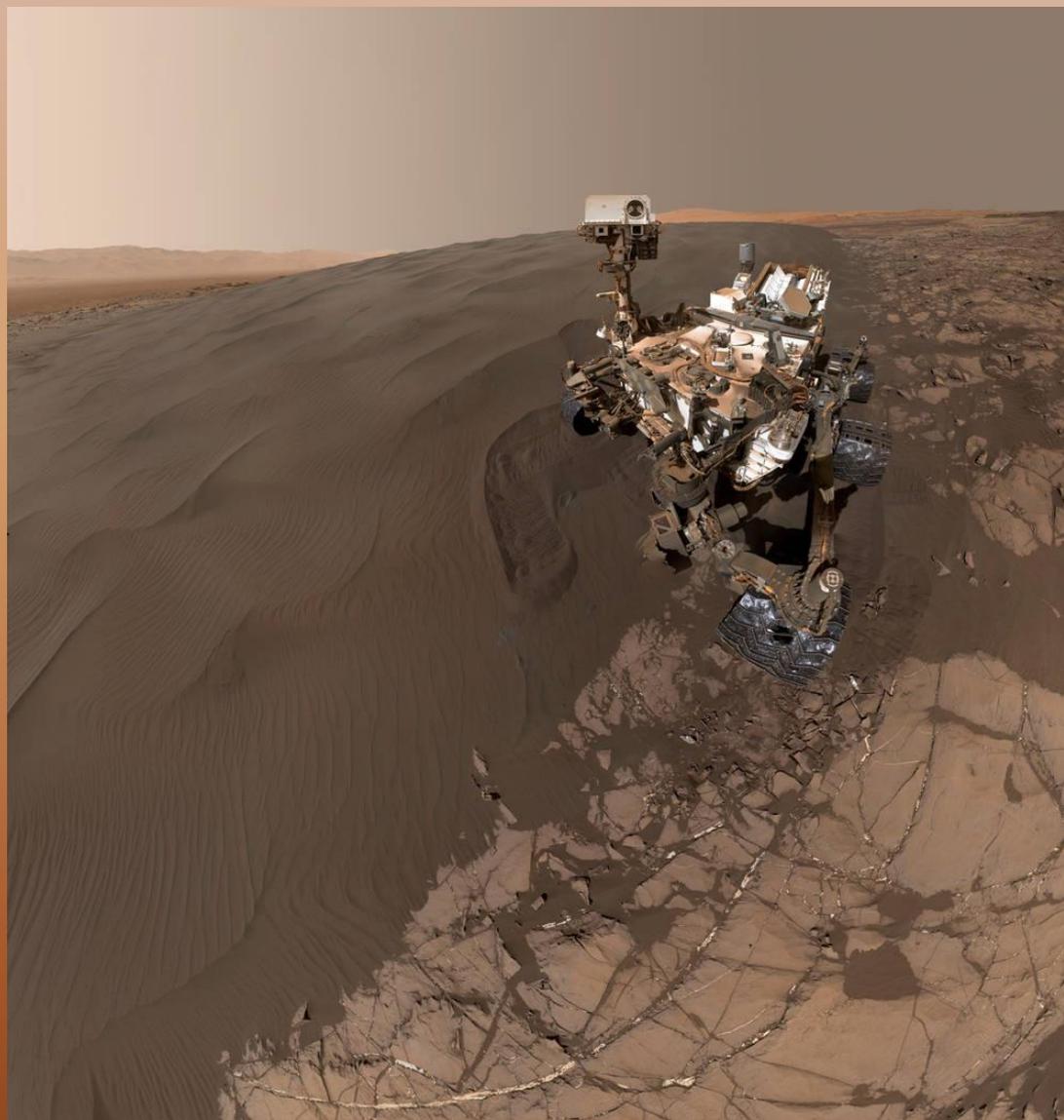
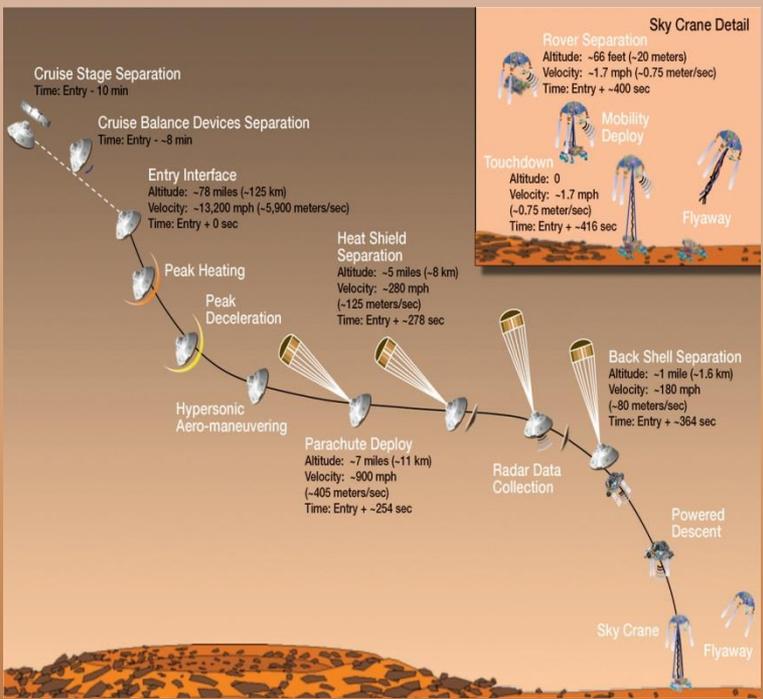
Click [HERE](#) for newest information.

Intended purpose:

Cassini orbits Saturn, studying the ringed planet and its moons in detail.

The **Huygens** probe landed on Saturn's largest moon, Titan, in January 2005 to study clouds, atmosphere, and surface.

In late 2016, the Cassini spacecraft began a daring set of orbits called the Grand Finale, which will be in some ways like a whole new mission. In September of 2017, Cassini dove into Saturn to end its mission. On its way, it continued to send data to Earth until it burned up in Saturn's atmosphere.



Launch Date: November 6, 2011

Destination: Mars

Landed on Mars: August 6, 2012

Type of craft: Lander / rover

Intended purpose: Determine if Mars was ever able to support microbial life.

Curiosity

Click [HERE](#) for newest information.

Hubble Space Telescope

Launch Date: April 24, 1990 by Space Shuttle Discovery

Destination: in orbit 353 miles above Earth

Type of craft: orbiting telescope

Intended purpose: Hubble has reshaped our perception of the cosmos with clear and deep views from above Earth's atmosphere.

Click [HERE](#) for newest information.



Ring Nebula

← Astronaut Steve Smith works on Hubble during the second servicing mission in 1997 with a ratchet. NASA specially designed the power tool to withstand the harsh environment of space, making it an essential item during three different Hubble missions. Hubble was specifically built to be serviced in orbit with replaceable parts and instruments. Astronauts performed four days of spacewalks during the second servicing mission to replace instruments and repair the telescope.

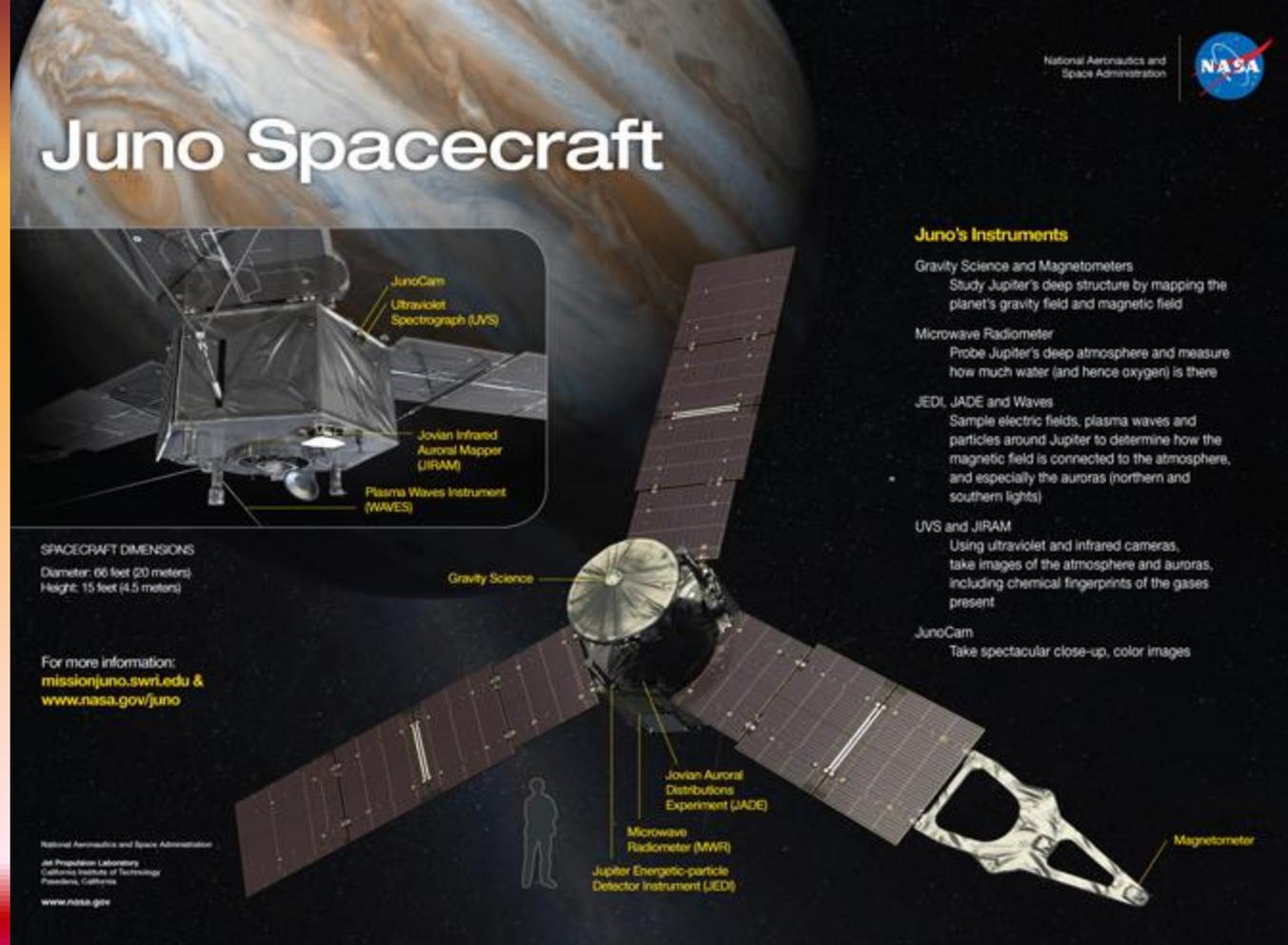
Juno

Destination: Jupiter
Type of craft: Orbiter

On January 13, 2016
NASA's Juno mission to Jupiter broke the record to become humanity's **most distant solar-powered probe.**

Mission Timeline:

- **Launch** - August 5, 2011
- **Deep Space Maneuvers** - August/September 2012
- **Earth flyby gravity assist** - October 2013
- **Jupiter arrival** - July 2016
- **End of mission (deorbit into Jupiter)** - Juno will continue to operate through July 2018, for a total of 12 science orbits. The team can then propose to extend the mission during the next science review cycle.



Intended purpose: Understand origin and evolution of Jupiter, look for solid planetary core, map magnetic field, measure water and ammonia in deep atmosphere, observe auroras.

Click [HERE](#) for newest information.



Dawn

Intended purpose: Learn more about formation and makeup of early solar system.

First mission to orbit two targets.

Ceres



Launch Date: September 27, 2007

Destination: Ceres and Vesta
Currently orbiting dwarf planet Ceres.

Reached Vesta: July 16, 2011

Reached Ceres: March 2015

Type of craft: Orbiter

Click [HERE](#) for newest information.

ISS International Space Station



Construction began: November 20, 1998

Destination: in orbit between 205-255 miles above Earth where it orbits Earth once every 90-minutes

Type of craft: Orbiter

ISS has been continuously occupied since November 2000, where it has housed over 200 people from 15 countries. Crew members spend about 35 hours each week conducting research in many disciplines to advance scientific knowledge in Earth, space, physical, and biological sciences for the benefit of people living on our home planet.

EXPEDITION 54 began in December 2017 and ends in February 2018. This expedition includes biology and biotechnology, technology demonstrations, astrophysics, and materials science. Three spacewalks are tentatively planned during Expedition 54.

THE CREW:

Soyuz MS-06 Launch: September 2017 • Landing: February 2018

Soyuz MS-07 Launch: December 2017 • Landing: April 2018



Aleksandr Misurkin (Roscosmos) – Commander

Born: Yershichi, Smolensk Region, Russia
Interests: badminton, basketball, downhill skiing, carting
Spaceflights: Exps. 35/36
Bio: <https://go.nasa.gov/2vAiNdr>



Scott Tingle (NASA) – Flight Engineer

Born: Attleboro, Massachusetts
Spaceflights: Exps. 54/55 is his first spaceflight
Bio: <https://go.nasa.gov/2z2tjKW>
Twitter: @Astro_Maker



Mark T. Vande Hei (NASA) – Flight Engineer

Born: Falls Church, Virginia
Interests: exercise, camping, windsurfing and reading
Spaceflights: Exps. 53/54 is his first spaceflight
Bio: <https://go.nasa.gov/2vzY0a8>
Twitter: @Astro_Sabot



Norishige Kanai (JAXA) – Flight Engineer

Born: Tokyo, Japan
Spaceflights: Exps. 54/55 is his first spaceflight
Bio: <https://go.nasa.gov/2z2hpkj>



Joseph Acaba (NASA) – Flight Engineer

Born: Inglewood, California
Interests: camping, hiking, biking, kayaking and scuba diving
Spaceflights: STS-119, Exps. 31/32
Bio: <https://go.nasa.gov/2vA7vWu>
Twitter: @AstroAcaba



Anton Shkaplerov (Roscosmos) – Flight Engineer

Born: Sevastopol, Crimean Region, Ukraine
Interests: fishing, golf, sports, travel
Spaceflights: Exps. 29/30, 42/43
Bio: <https://go.nasa.gov/2z2bhZu>
Twitter: @Anton_Astrey

THE SCIENCE:

What are some of the investigations the crew is operating?

During Expedition 54, researchers will study bacteria, manufacture fiber optics in microgravity, measure the total amount of sunlight Earth receives, gather data on space debris in low-Earth orbit, and study self-replicating materials.

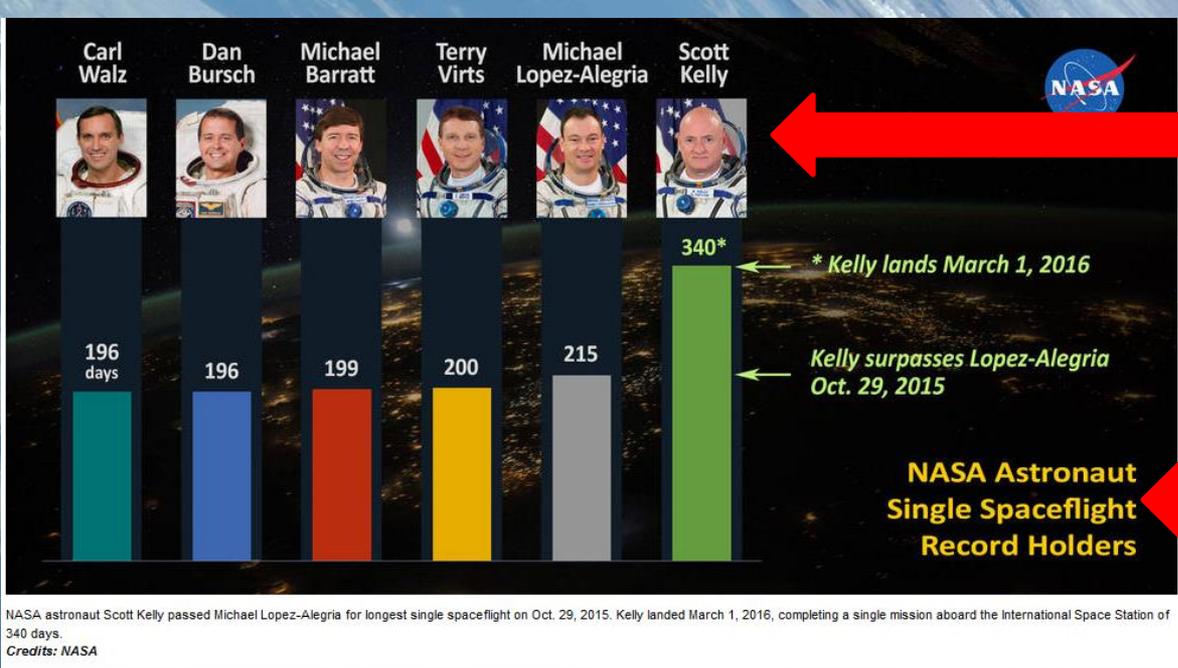
Current Crew of ISS



THE MISSION **PATCH:**

Orbiting Earth continuously since 1998, the International Space Station (ISS) is one of our greatest engineering achievements. It is depicted in gold, symbolic of constancy and excellence. Flying toward a sunrise represents the station's contributions to a bright future. That sunrise uses blue, white, and red, the combined national colors of Japan, Russia, and the United States, symbolizing the crew's cohesiveness. Crewmember names are in blue, symbolizing devotion and loyalty. The gold border represents the constant human presence in space onboard the orbiting laboratory. Symbolic of new Russian and U.S. spacecraft that will advance human exploration, the patch is shaped as a capsule. The number 54 is drawn as a path eventually leading to Mars. Finally, the stars symbolize the values of leadership, trust, teamwork, and excellence lived by mission control teams throughout the history of human space programs, as well as the global vigilance of those teams while operating the station.

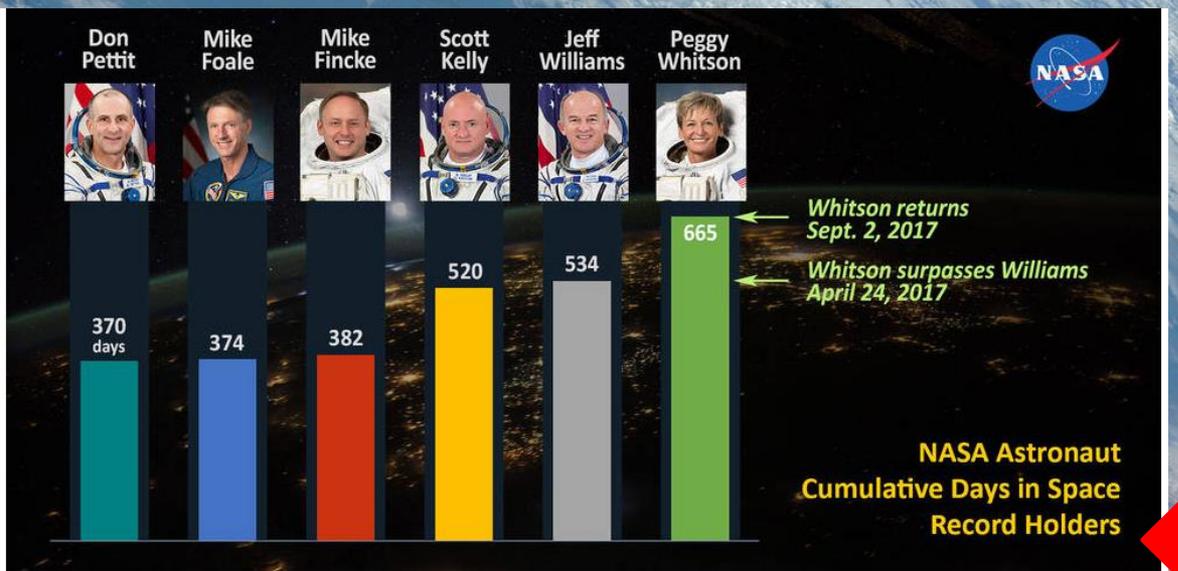




Scott Kelly and His #YearInSpace

NASA astronaut Scott Kelly passed Michael Lopez-Alegria for longest single spaceflight on Oct. 29, 2015. Kelly landed March 1, 2016, completing a single mission aboard the International Space Station of 340 days.
Credits: NASA

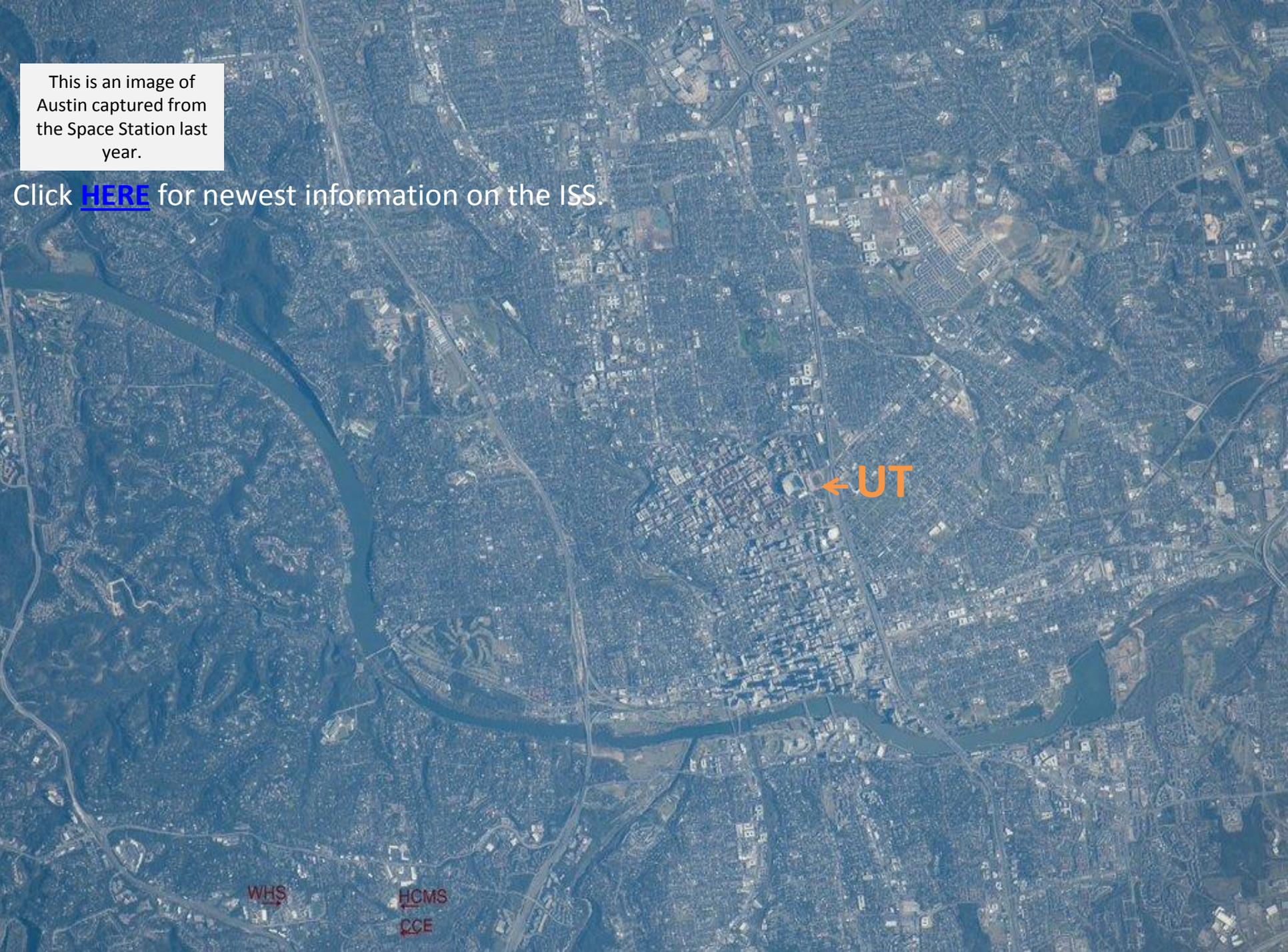
as of September 3, 2017



Peggy Whitson set the record on Sept. 2, 2017, for most cumulative days living and working in space by a NASA astronaut at 665 days.

This is an image of Austin captured from the Space Station last year.

Click [HERE](#) for newest information on the ISS.



Orion Spacecraft

NASA's Orion spacecraft is built to take humans farther than they've ever gone before, like Mars.

Orion will:

- serve as the exploration vehicle that will carry the crew to space,
- provide emergency abort capability,
- sustain the crew during the space travel, and
- provide safe re-entry from deep space return velocities.

First Flight – December 5, 2014
a two-orbit, four-hour flight that tested many of the systems most critical to safety like launch and high speed re-entry systems, attitude control, parachutes, and the heat shield. Results of the mission are a craft that is 500 pounds lighter with fewer parts.



Orion Spacecraft

What's next?

EM-1 (Exploration Mission-1) will test the unmanned vehicle in 2018 to prepare for a manned mission in 2023 – YOUR JUNIOR YEAR!

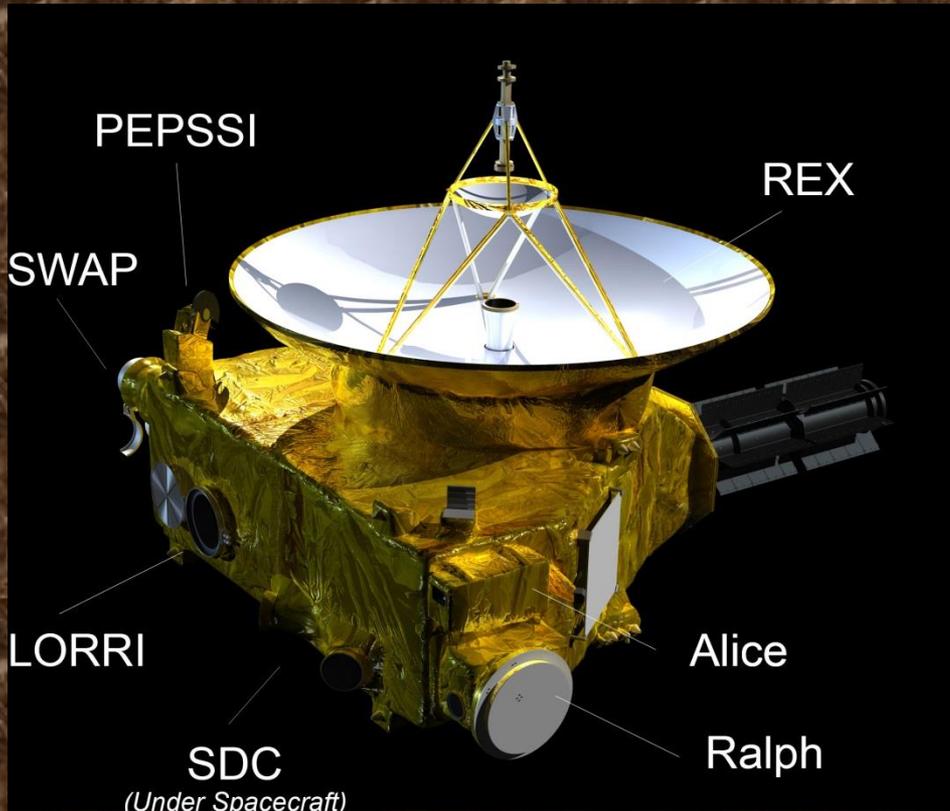


Orion will launch on NASA's new heavy-lift rocket, the *Space Launch System*. More powerful than any rocket ever built, SLS will be capable of sending humans to deep space destinations such as an asteroid and eventually Mars.

Exploration Mission-1 will be the first mission to integrate Orion and the Space Launch System.

Click [HERE](#) for newest information.

New Horizons



Launch Date: January 19, 2006

Gravity assist at Jupiter: February 2007

Reached Pluto: July 14, 2015

Destination: Pluto and farther into the Kuiper Belt

Type of craft: Flyby

Intended purpose: Answer questions about Pluto, its moons, and Kuiper Belt objects

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Rosetta-Philae

This mission is over, but it's really cool, so we wanted you to learn about it.

Intended Purpose:

Rosetta's main objective was to meet up with, and enter orbit around, a comet named Churyumov-Gerasimenko ("*Cheery-im-off Gu-ris-i-menko*")

It was to perform observations of the comet's nucleus and coma. The timing was perfect so that Rosetta was able to measure the comet at the peak of its activities while it was closest to the sun. On November 12, 2014, a lander named Philae was deployed and made the first soft landing on a comet. **(Read that again: WE BUILT SOMETHING THAT LANDED ON A COMET!)**

Once it landed, the solar panels on Philae did not open to face the sun as expected, so we did not learn as much as we had hoped to.

Launch Date: March 2, 2004

Reached Comet: August 6, 2014

Mission was scheduled to end:
September 2016

Rosetta: Orbiter **Philae:** Lander



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If you finish the chart on page 1 of your handout AND completed the notes for the newest information, you may scroll through the next two pages on this presentation and explore those links provided.

You can see the Space Station fly overhead at night; go to this site to see the times you can see it. You can also sign up for text alerts, and you will receive a text of when to look for it.



Location: Austin, Texas, United States

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The following ISS sightings are possible from Friday Feb 9, 2018 through Sunday Feb 25, 2018

Date	Visible	Max Height	Appears	Disappears	Share Event
Sat Feb 10, 7:30 PM	1 min	17°	10° above NNW	17° above N	f t
Sun Feb 11, 6:39 PM	2 min	11°	10° above NNE	10° above NE	f t
Sun Feb 11, 8:14 PM	1 min	19°	10° above NW	19° above WNW	f t
Mon Feb 12, 7:22 PM	4 min	58°	11° above NW	37° above ESE	f t
Tue Feb 13, 8:08 PM	1 min	17°	16° above WSW	16° above SW	f t
Wed Feb 14, 7:16 PM	4 min	39°	34° above W	10° above SSE	f t
Fri Feb 16, 7:10 PM	< 1 min	12°	12° above SW	10° above SSW	f t
Fri Feb 23, 6:29 AM	3 min	29°	11° above S	29° above SE	f t
Sat Feb 24, 5:38 AM	2 min	13°	10° above SSE	13° above SE	f t

Scott Kelly and His #YearInSpace

This time last year, we were eagerly awaiting Scott Kelly's return to Earth after being at the ISS for a year. He and his twin brother, Mark who is also an astronaut, are involved in medical studies to see how being in space for a prolonged period of time affects the body.

As time allows go here to read new results of this study:
<https://www.nasa.gov/twins-study>

Time Magazine produced a documentary program on this mission. You can find it here and watch at home or with permission from teachers in free-time.

<http://time.com/space-nasa-scott-kelly-mission/>

