

Saturn's Wildest Weather

The Cassini spacecraft zooms above Saturn's clouds. It's cold here. Little sunlight reaches the craft. Launched in 1997, Cassini reached Saturn in 2004. Since then, it has made many fantastic finds. Cassini discovered many moons. It found chemical lakes and dunes on Saturn's largest moon, Titan. It spotted water and other chemicals blasting from geysers on another moon, Enceladus.

Scientists and engineers back on Earth made all this possible. They used science, engineering, and math to design the technology that makes up Cassini. No one person could do this. Hundreds of engineers and scientists built Cassini. They wired it. They launched it. Then they programmed it for one of the greatest voyages of exploration ever undertaken. It now studies Saturn's moons, rings, and wild weather.

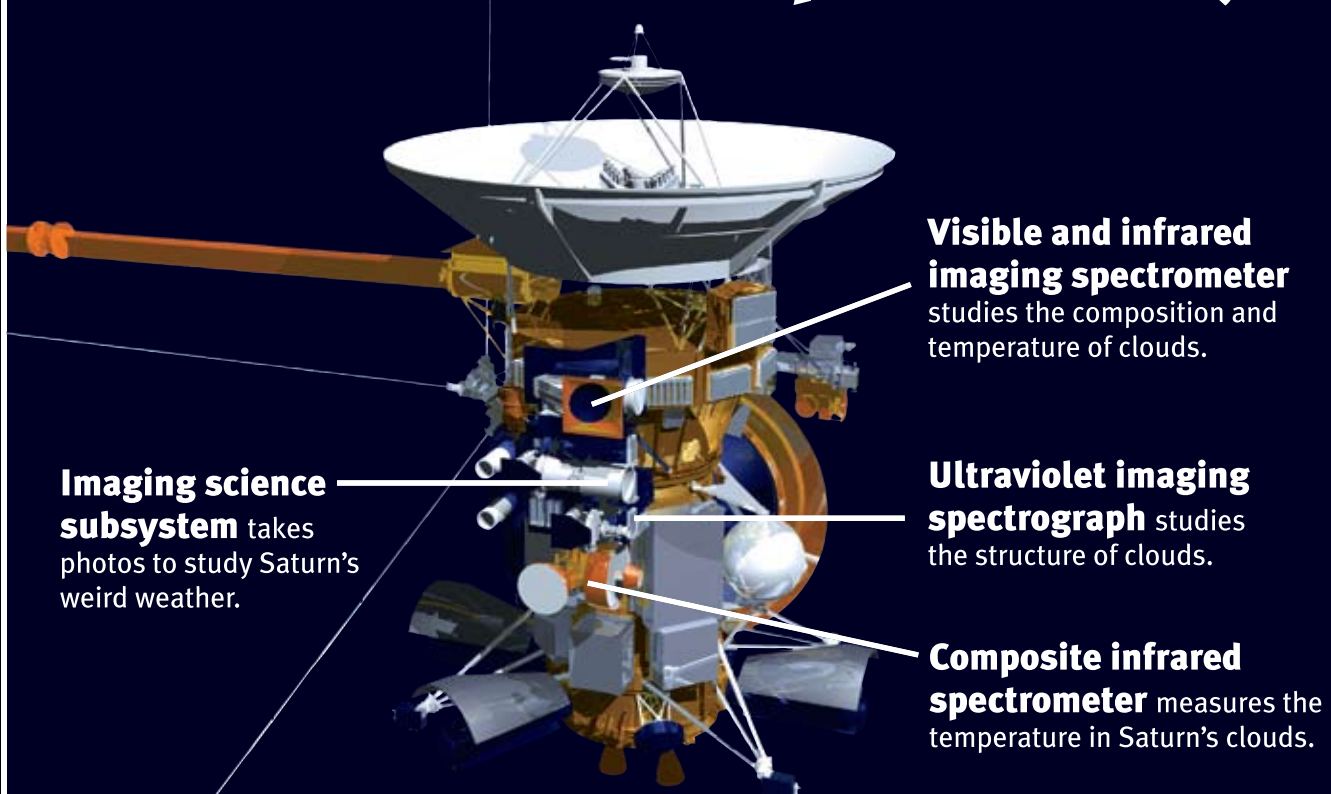
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JON WILLIAMS/SOLUBAN PRESENTATIONS

The Cassini Spacecraft



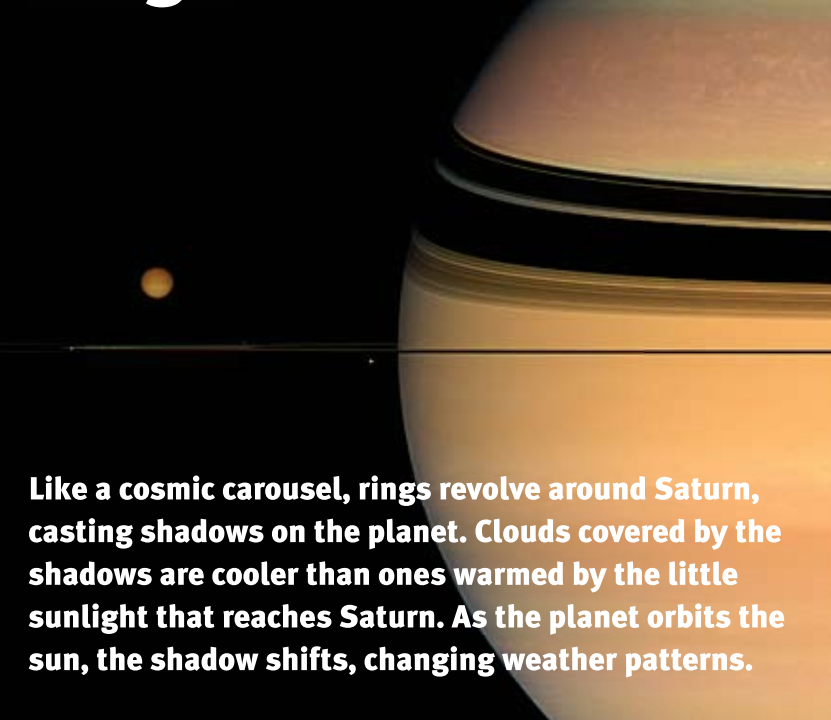
Visible and infrared imaging spectrometer studies the composition and temperature of clouds.

Ultraviolet imaging spectrograph studies the structure of clouds.

Composite infrared spectrometer measures the temperature in Saturn's clouds.

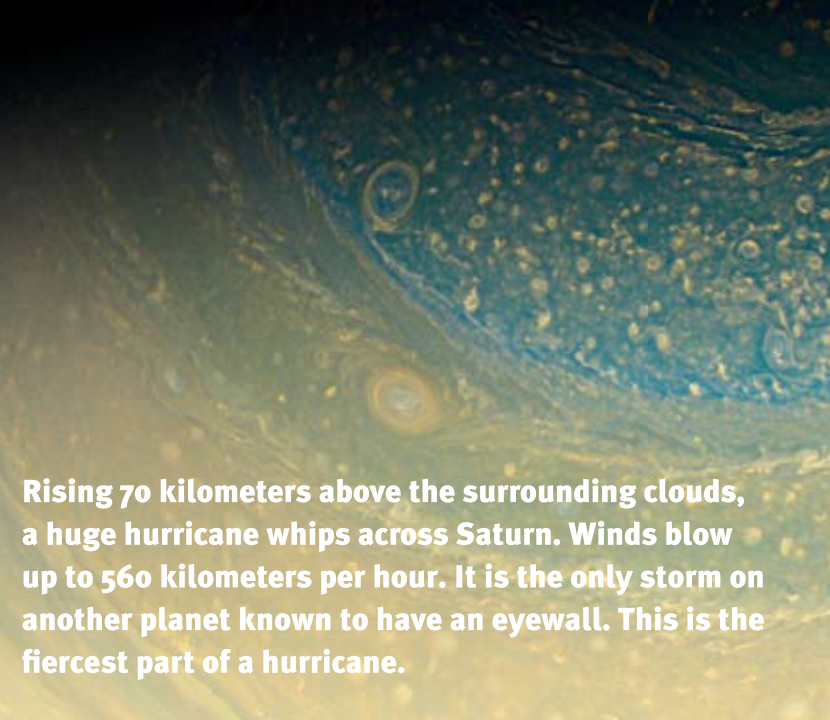
Imaging science subsystem takes photos to study Saturn's weird weather.

Rings



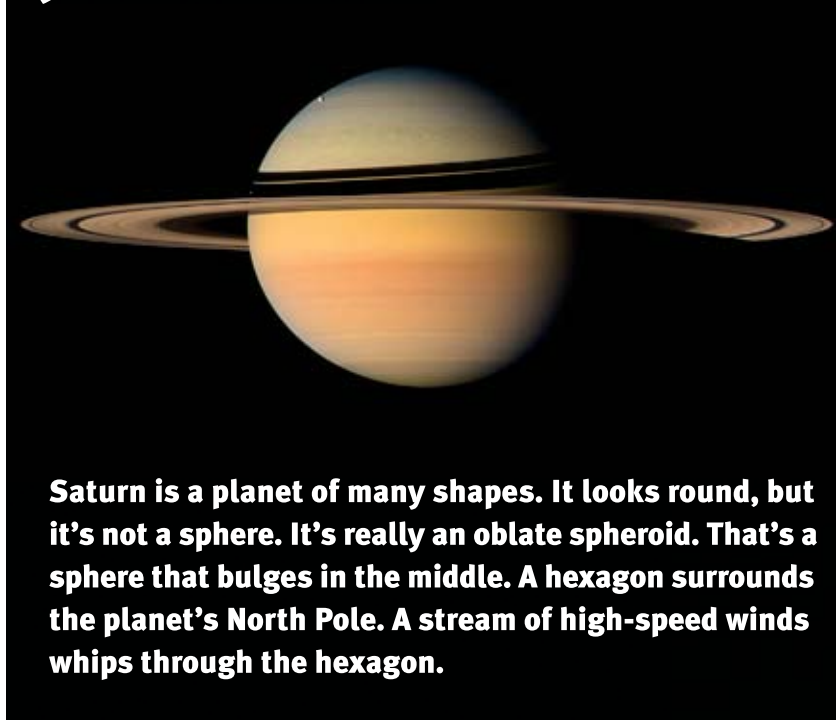
Like a cosmic carousel, rings revolve around Saturn, casting shadows on the planet. Clouds covered by the shadows are cooler than ones warmed by the little sunlight that reaches Saturn. As the planet orbits the sun, the shadow shifts, changing weather patterns.

Hurricane



Rising 70 kilometers above the surrounding clouds, a huge hurricane whips across Saturn. Winds blow up to 560 kilometers per hour. It is the only storm on another planet known to have an eyewall. This is the fiercest part of a hurricane.

Jet Stream



Saturn is a planet of many shapes. It looks round, but it's not a sphere. It's really an oblate spheroid. That's a sphere that bulges in the middle. A hexagon surrounds the planet's North Pole. A stream of high-speed winds whips through the hexagon.

Lightning



The Dragon Storm whips around Saturn. Huge bolts of lightning streak through it and other storms. Many of these storms are located in an area called "Storm Alley." Some of the large storms in this area create smaller storms that spin off on their own.

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Dear Educator,

Is your school "Wild About Space?" NATIONAL GEOGRAPHIC EXPLORER is proud to launch the **Space Probe Challenge**, a contest based on the upcoming National Geographic film, *Wildest Weather in the Solar System*. Two winning classrooms will receive the "Wild About Space" Grand Prize for their school that includes:

- a visit from a NASA astronaut and a National Geographic expert space filmmaker
- a Promethean ActivBoard
- \$500 worth of National Geographic books for the classroom
- a National Geographic gift bag for every student in the class

The National Geographic film, *Wildest Weather in the Solar System*, is a journey through our solar system to experience the wild weather on each planet. As the film will show, scientists and engineers must work together to make space probes that study weather on distant planets.

Similarly, the **Space Probe Challenge** asks teams of students to design and label a probe that contains instruments to measure the weather on a selected planet. To help prepare your students for this challenge, National Geographic has developed a host of teaching tools about our solar system, space probes, and wild weather on the planets.

In this issue of NATIONAL GEOGRAPHIC EXPLORER, you'll find:

- "Saturn's Wildest Weather" poster and teaching guide
- Space Probe Challenge contest checklist
- \$500 worth of National Geographic books for the classroom
- website links to online resources at www.wildstweathershow.com, including:
 - 10 STEM activities for grades 2-8
 - space-themed interactive whiteboard content

This classroom poster will introduce students to the weather on the second-largest planet in our solar system. Here, storms abound. Wicked winds blow. Lightning flashes. Hurricane winds whip. This poster is a terrific reference guide for students as they create their own winning probe. **All entries must be received by January 14, 2011.**

Good luck!

Rules

NO PURCHASE NECESSARY. A PURCHASE WILL NOT INCREASE YOUR CHANCES OF WINNING. LEGAL RESIDENTS OF THE 50 UNITED STATES (D.C.), 18 YEARS AND OLDER WHO ARE TEACHERS OF STUDENTS IN GRADES K-8 AT AN EDUCATIONAL FACILITY AND WHO did not purchase any equipment for purposes of entering the Contest. VOID WHERE PROHIBITED. Enter Contest by 11:59 p.m. Eastern Standard Time on www.wildstweathershow.com. Sponsor: NATIONAL GEOGRAPHIC, Cinema Ventures, 1143 17th Street N.W., Washington, DC 20036.

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Use a copy ratio of 125% to print out worksheets at full size.

SATURN NOVEMBER-DECEMBER 2010



Saturn's Wildest Weather

About the Poster
Saturn is the sixth planet from the sun and one of the largest in our solar system. Until recently, scientists studying Saturn relied on blurry photos taken through telescopes and grainy photos taken by spacecraft more than 30 years ago. That has changed thanks to the Cassini spacecraft and its mission to study Saturn. This poster explains how thousands of images sent by Cassini have given scientists a peek into the wild weather on Saturn.

Using this poster guide as well as the STEM activities and interactive whiteboard content on the National Geographic website www.wildstweathershow.com will help prepare your students for the **Space Probe Challenge**. Together, you will go on an amazing journey through all the planets in our solar system.

SATURN NOVEMBER-DECEMBER 2010



Saturn's Wildest Weather

Explore Science
Now point to the fourth photo ("Lightning") and invite a volunteer to read aloud its caption. Ask: *What do you know about Earth's orbit?* Remind students that it takes one year, or 365 days, for Earth to orbit the sun. Tell them that it takes Saturn 29.7 (almost 30) years to orbit the sun. Ask: *How many times does Earth orbit in that time?* (23.7—almost 30 times)

Point to the second photo ("Hurricane") and invite a volunteer to read aloud its caption. Ask: *How fast do you think winds blow on Earth?* Record all reasonable responses. Explain that a Category Five hurricane, the most severe rating for a hurricane on Earth, can have winds greater than 249 kilometers per hour (155 mph). Ask: *How many more kilometers per hour were the winds blowing on Saturn?* (about 300 km)

Point to the third photo ("Jet Stream") and invite another volunteer to read aloud its caption. Explain to students that Saturn's rotation squishes the planet into an oblate spheroid. Demonstrate the shape by taking a partially inflated balloon and holding it so that your hands are on the top and bottom of the balloon. Gently squeeze it so that the middle bulges slightly. Tell students that rotational speed causes Saturn, the sun, and other planets to bulge.

Now point to the fourth photo ("Lightning") and invite a volunteer to read aloud its caption. Ask: *What do you know about lightning on Earth?* Invite a volunteer to read aloud the caption. Ask: *What do you know about lightning on Saturn?* Invite a volunteer to read aloud the caption. Ask: *How many times as strong? Three times as strong? Five times as strong?* Discuss how much bigger and longer-lasting storms are on Saturn.

Then read aloud each label in the diagram. Lead a class discussion about what kinds of things may be observed with these instruments. Ask: *How can engineers and mathematicians help scientists learn more about Saturn and other planets?* (They can design spacecraft and equipment to study planets.)

Now that students have weathered the wildest weather on Saturn, it's time to look at the weather on other planets and compare them. Hand out **The Wildest Ride** activity on p. 14 and explain the directions to students.

Now your students are ready to blast in the **Space Probe Challenge**. See the insert in this issue and go to www.wildstweathershow.com. You'll find even more exciting STEM materials and information about the contest.

Dear Parent or Guardian,

Our classroom is "Wild About Space!" We are set to launch an exciting learning adventure through the solar system. We'll journey by all eight planets, learning about each one's unique weather systems.

As part of this exciting space adventure, we are taking part in the **Space Probe Challenge**, a contest based on the upcoming National Geographic film, *Wildest Weather in the Solar System*. Our students will work in teams to design a space probe that studies the weather on one of the planets in our solar system that they have selected.

If a winning probe is selected from our classroom, our school will receive the "Wild About Space" Grand Prize which includes:

- a visit from a NASA astronaut and a National Geographic expert space filmmaker
- a Promethean ActivBoard for our classroom
- \$500 worth of National Geographic books for our classroom
- a National Geographic gift bag for every student in the class

The students are excited about the contest and would love to tell you more about their probe! Ask them which planet they have selected and what weather they expect to find. If you'd like to find out more yourself, visit the National Geographic website www.wildstweathershow.com to do your own homework!

We will let you know how the contest turns out. In the meantime, keep on exploring.

Sincerely,

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OBSERVE

Name: _____

Observation Journal

Imagine you're a scientist studying the weather on a planet orbiting a distant star. Record the weather conditions on that planet and what you learned about them.



- Name the planet you're studying.
- Name the spacecraft studying that planet.
- Describe the planet's physical characteristics. Is it a small, rocky planet, or a gas giant? How fast does it rotate? How far is it from its sun?
- What is the weather like near its poles? What is the weather like near its equator?
- How long is a year on the planet? How does that affect its seasons?
- What is the wildest weather you've seen on this planet?

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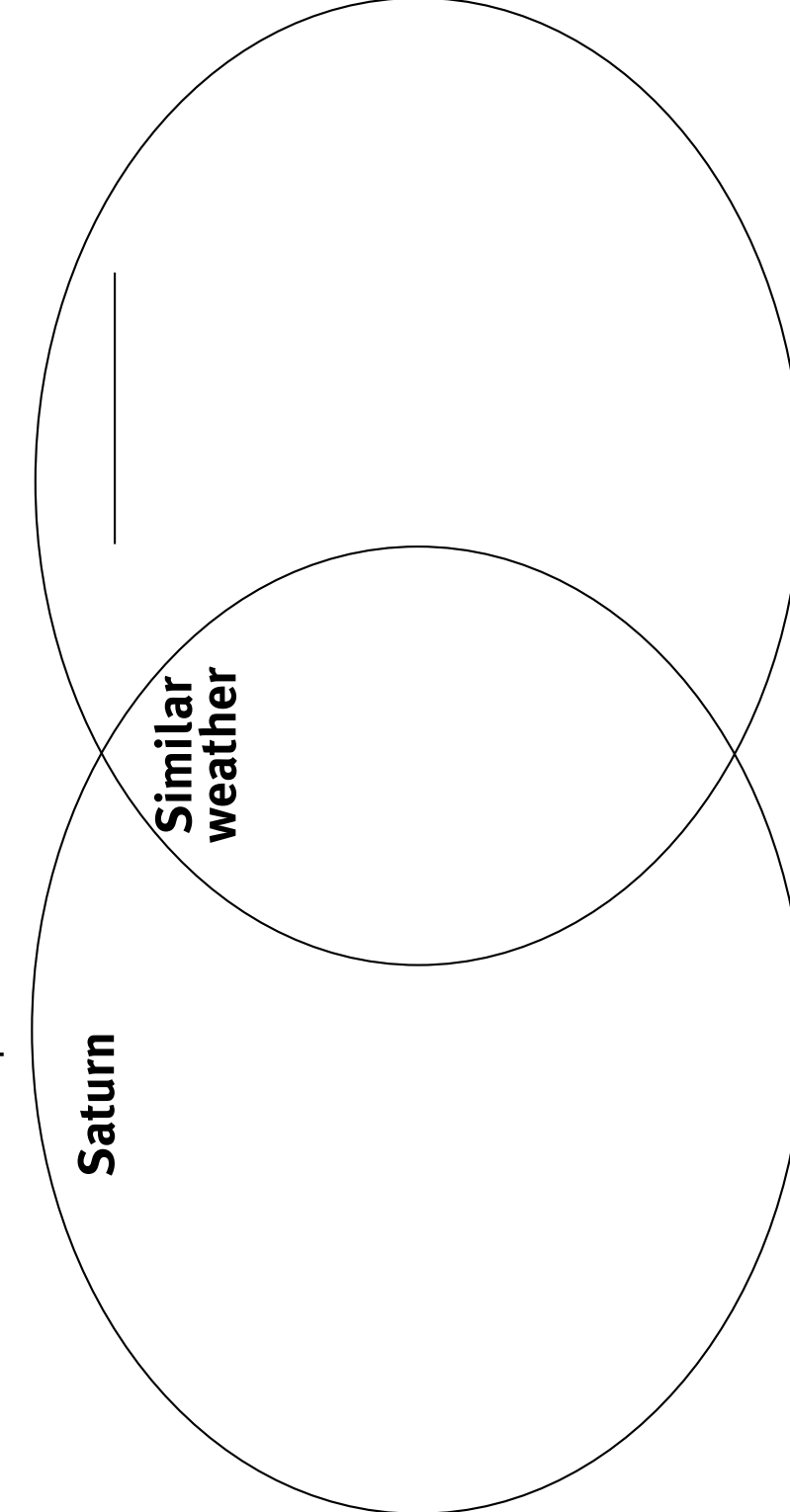


COMPARE

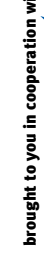
Name: _____

The Wildest Ride

You've weathered the storms on Saturn. Now it's time to pick a planet and study its weather. After learning about its weather, compare the weather on Saturn to the weather on your planet. Write your planet's name on the line below. Then write the weather on each planet in the circle below its name. List similar weather conditions in the middle.



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