

# Activity 4

## Saturn's Fascinating Features

### Overview

During this activity, your youth:

- Are introduced to several of Saturn's exciting features that are of particular interest to scientists and that capture the imagination of all!
- Develop their listening and writing skills.
- Make and Take: Their own multi-layer 3-d book of Saturn, with diagrams showing its various layers, ring system, and many moons.



### Time/number of sessions

Two 40-minute sessions

### Activity Type

Journaling and art

### Space Needed

Classroom or cafeteria, space with tables and chairs

### Activity Goals

Youth will:

- Learn to write with scientific accuracy to characterize Saturn and its features.



### Where's the Science and Engineering?



- Saturn is often referred to as the “jewel of the solar system.” Its striking rings and numerous icy moons set it apart from the other planets.
- Planets have distinct features that interest scientists and motivate our ongoing planetary exploration. For example:
  - Cassini-Huygens mission scientists are exploring Saturn's atmosphere to learn more about its temperature, cloud properties, structure, and rotation.
  - The configuration of Saturn's rings, their sizes, and the distribution of material within them are also being studied by scientists.
  - The icy satellites that orbit Saturn are under investigation as scientists explore satellites embedded in the rings and their composition.
- Most of Saturn's moons orbit along the plane of the rings, but Phoebe does not. It orbits outside the ring plane and also orbits in opposition to the rest of the moons! The youth will notice this “disorder” and comment on it.



**National Science Education Standards**

#### K-4

#### Physical Science

- Properties of objects and materials
- Objects in the sky
- Changes in environments

#### 5-8

#### Physical Science

- Changes of properties in matter
- Structure of the Earth system



## Equity/Leveling the Playing Field

- In this activity, youth present their work to the group. This may be more comfortable for some than others.
- Create an environment where they will feel comfortable presenting in front of the group telling them that they should think of themselves as “critical friends” who give positive constructive input.
- Explain that critical friends will give positive feedback and helpful suggestions for improvement.
- “Mirroring” is a good way to ensure this will happen, such as: “What I like about your work is...” “What you drew that is missing from my drawings is...”
- This can be followed by a “critical friends” statement, such as “What I would change about your drawing is...”
- Emphasize the idea of being supportive and helpful.



## Materials

### From Your Supply Closet

Session For Students

- 1 Crayons  
Scissors; paper clips  
Silver glitter glue (optional)

- 2 Stapler  
Black construction paper, 8-1/2 x 11, cut in half



### From a Photocopier/Printer

Session For Leader

- 1 For optional leader reading: a copy of the mini-book “Saturn from the Outside In” (from Activity 3 — “Discovering Saturn: The Real Lord of the Rings”)  
Several color images of Saturn of your choosing. Find them embedded in this guide, or go to: [saturn.jpl.nasa.gov/photos](http://saturn.jpl.nasa.gov/photos)
- 2 For optional leader reading: a copy of the mini-book “Those Amazing Rings” (from Activity 3 — “Discovering Saturn: The Real Lord of the Rings”)  
*The Ringed World of Saturn* Leader Instruction Sheet

For Students

*The Layers of Saturn* 3-d book pages (a complete copy for each student)

## Getting Ready

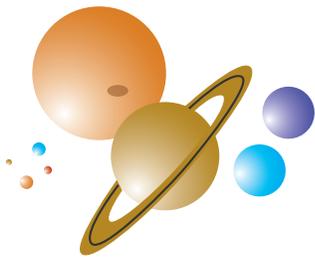
Cut the black construction paper pieces width-wise (to make pieces about 4 x 6 inches).

Cut your own 3-d book pages. Cut along the line above the writing space, following the upper shape of the rings or the planet. Be sure to cut the oval inside the rings.



## Leader Tips

- Practice cutting and constructing the 3-d book in advance.



# Saturn's Fascinating Features

## Student Activity

### Session 1 • Creating the Book Pages

(Optional) Leader Reading — Read aloud the second and third paragraphs of page 3 from the mini-book “Saturn — From the Outside In,” showing the illustrations.

Distribute one set of *The Layers of Saturn* book pages plus one piece of black construction paper to each student. The black paper will serve as the back cover for their books.

1. Model for the group how to cut each of the pages. Cut along the line about the writing space, following the upper shape of the rings or the planet. Be sure to cut the oval inside the rings.
2. Show the group the latest pictures of Saturn from books, the Internet, posters, or newspapers to give the students an accurate picture of what Saturn looks like. If you are limited on Internet access, show them pictures embedded throughout this guide. For excellent images, visit: [saturn.jpl.nasa.gov/photos](http://saturn.jpl.nasa.gov/photos)
3. Have the youth use crayons to color the various pages of Saturn. Explain to them that the colors they see in pictures of Saturn and its rings are often enhanced or color has been added to the images to bring out details. Suggested colors for the pages are as follows:

#### *Features of Saturn*

Rings  
Surface  
Rocky Core  
Metallic Hydrogen Gas  
Hydrogen Gas

#### *Colors*

Light brown  
Yellow or tan with wide brown stripes  
Orange  
Orange and brown  
Yellow

4. If you are using optional silver glitter glue, put a small amount of it on the rings and ask the youth to spread it around the rings to make them look icy.
5. Ask them to draw/decorate the frozen moons of Saturn on the inside of the back cover. They can be labeled. Don't forget that Titan is the largest!



# Activity 4

6. To add stars to the background, the youth can dot a small amount of glitter glue to the top half of the black construction paper.
7. Set the pages aside to dry.

### **Session 2 • Writing the Book**

1. (Optional) Leader Reading — Read aloud all of page 3 from the mini-book “Those Amazing Rings,” showing the illustrations.
2. Return the pages of the 3-d books to the youth.
3. Ask them to listen very carefully to what you are about to read about Saturn (using *The Ringed World of Saturn* Leader Instruction Sheet).
4. After you have read about each of Saturn’s features, stop and ask the students to write in their books on the page that corresponds to the content you just read. Here are some sample sentences to show what successful youth writing may look like:
  - The rings: Saturn has rings. The rings are icy. The rings are big. The rings have gaps. One is the Cassini Division.
  - The surface: Saturn is cloudy. Saturn is windy. The wind makes Saturn look striped. Saturn’s winds are fast.
  - The rocky core: The core is metallic — iron — surrounded by molten rock.
  - Hydrogen gas layer: The first layer of gas is hydrogen gas. Saturn has gases. You cannot stand on Saturn.
  - Metallic hydrogen gas layer: Saturn is made of different gases. This layer is hot.
  - The gases spin fast on Saturn.
5. Consider reading parts of the script again to assist the students in selecting information.
6. Staple the pages along the left edge of the bottom half of the black construction paper when the writing is complete.
7. Slip the planet into the rings and the book is complete.

### **Questions for the Youth (Informal Assessment)**

- What is Saturn’s system like?
- What Saturn layer would you like to visit? Why? Would you need special equipment? (Some ideas could be a protective suit, an airplane to fly through clouds, etc.)
- What other activities can the group do to learn more about what Saturn is like?

### **Sharing the Findings (Informal Assessment)**

- Have the youth practice reading their books to each other.
- Have the youth make presentations to the group or to other groups.

### **Leader Reflection/Assessment**

At the end of this activity, think about the following:

1. Were the children happy with and proud of their books?
2. Were they comfortable reading their books out loud, or presenting?
3. Were they interested and engaged in creating the books?

### **Glossary**

**Core** — Center, middle, center of the mass.

## Information for Families

Creating 3-d “books” is a great way for young people to become the “experts” on any topic.

Encourage parents to include their youth’s Saturn book in the family library. Ask parents to help their child create a page labeled “About the Author.”

Parents can go to the Cassini website with their child to collect information for a “Ten Facts About Saturn” book.

## NASA Resources

### Role Model Resource



Amy Simon-Miller is an astrophysicist at Goddard Space Flight Center, specializing in planetary atmospheres of the giant planets. She is a Co-Investigator for one of Cassini’s instruments, responsible for science planning, command design, and data analysis. When Dr. Sally Ride became the first American woman in space, Amy knew then that she wanted to study space and work for NASA. One highlight in her career has been watching comet Shoemaker-Levy 9 fragments hit Jupiter from behind the scenes at the Space Telescope Institute. “We were just blown away by the spectacular images and the marks left by each impact.”

“Sometimes you have to tackle a problem from many different ways to understand it and you should never be afraid to ask for help until you do understand,” Amy says regarding science careers. “To advance in any field, we need people who think about problems in different ways!”

Read more about Amy at: [solarsystem.nasa.gov/people/profile.cfm?Code=Simon-MillerA](http://solarsystem.nasa.gov/people/profile.cfm?Code=Simon-MillerA)

### Other Resources

Download wallpaper for the classroom computer! [www.jpl.nasa.gov/spaceimages/searchwp.php?category=saturn](http://www.jpl.nasa.gov/spaceimages/searchwp.php?category=saturn)

### Taking Science to the Next Step

Give the youth time to go to the NASA website at [www.nasa.gov](http://www.nasa.gov). Encourage them to “surf” the site looking for more Saturn information to add to their Saturn logs or the Saturn books.

Ask them to brainstorm a list of questions they have after making the Saturn books.

### Literacy

Ask the youth to write a story about traveling to Saturn’s moons. Encourage them to include information from the script.

Have the youth add a page labeled “About the Author” and have them write a couple of paragraphs about themselves and their interest in Saturn.

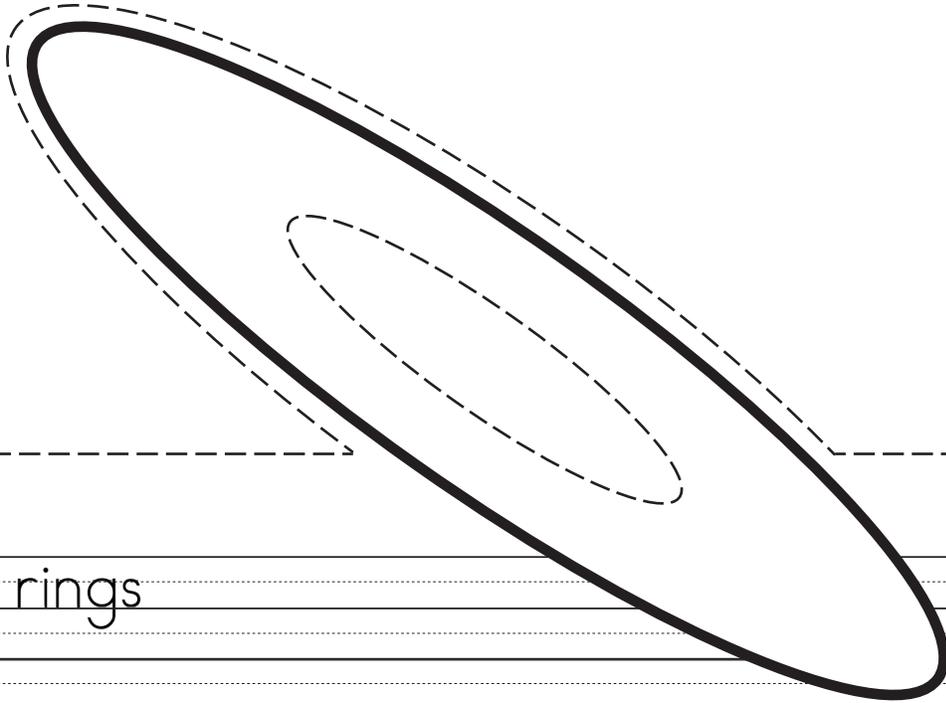


# The Layers of Saturn

By \_\_\_\_\_



## Activity 4 Materials



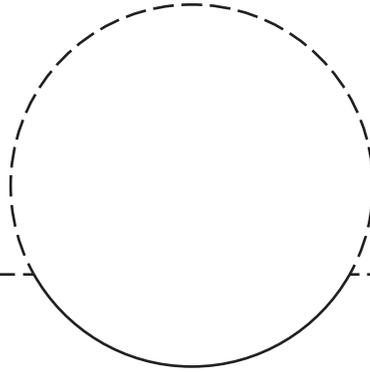
The rings





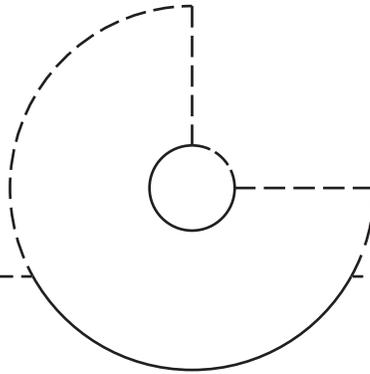
# Activity 4 Materials

The Layers of Saturn (2 of 3)



2

The surface



3

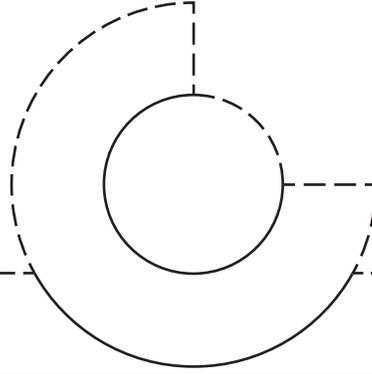
The rocky core





# Activity 4 Materials

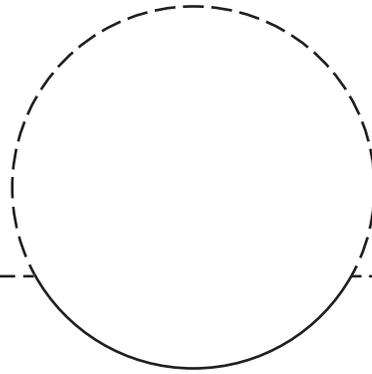
The Layers of Saturn (3 of 5)



4

Metallic hydrogen gas

Scissors icon



5

Hydrogen gas

Scissors icon





### The Ringed World of Saturn

Saturn is the sixth planet from the Sun. Because it is so far from the Sun, it doesn't get much sunlight and it is very, very, very cold! It is much sunnier and warmer on Earth. Don't worry about getting a sunburn on Saturn!

Saturn moves much slower in its orbit around the Sun than Earth does. It takes Earth one whole year — 365 days — to go all the way around the Sun. But it takes Saturn almost 30 Earth years to go all the way around the Sun! That's a long, long time.

The first thing most people notice about Saturn is its very special rings. They are very, very big. Saturn is far, far away from us — so far, in fact, that Saturn looks a lot like a small speck of light in the sky. While the Cassini spacecraft is close to Saturn and its rings, we are finding many new things about Saturn and what is around it.

Let's begin our trip to Saturn.

Imagine you are the Cassini spacecraft and you have been on the very, very long trip to Saturn. The trip from Earth to Saturn takes about 7 years, traveling day and night! Space is a very, very big place! After being in space for all that time, you see a beautiful planet in the distance. As you get closer, you realize it is a huge gas planet with rings. What do you think it is? It's Saturn!

#### *First Stop — The Rings*

You might think there are only two rings around Saturn, but hundreds of rings form the ring system of Saturn. Scientists use letters to name the rings, and they have named 7 ring zones so far. We can see some of the rings from Earth using telescopes. We can observe the outer zone, called the A ring, and the brighter, inner zone called the B ring. The big space between the A and B rings is called the Cassini Division.

The rings are very wide, but very thin! Some of the rings look like they are braided — they are pretty complicated. Some of the rings even look twisted. There are also some small moons in the rings.

The rings are made mostly of chunks of water ice and ice-covered rock. Some of the chunks are small and some are pretty big — some are the size of a grain of sand, some are as big as a house. The rings do not stay in one place, but orbit Saturn, just like Earth orbits the Sun. Things are really moving in space!

*Saturn's Surface*

Saturn is covered with thick clouds. The top layer of the clouds is very cold. We have seen big storms in Saturn's clouds. It is very windy on Saturn. The clouds move and make Saturn look striped. The moving clouds give Saturn the swirling yellow and gold cloud bands that we see. Saturn also has big white spots. Scientists think the white spots may be big storms.

Now let's look past the clouds at Saturn's core and its gas layers.

*Saturn's Core*

The very center of Saturn is called the core. The core is metallic — iron — surrounded by molten rock. Molten means melted — the center is made of liquid rock. Earth's core is also made of molten rock. Why do you think it is liquid rock? The reason is, it is very, very hot and rock that is so hot melts into a liquid, like lava from volcanoes here on Earth.

*Saturn's Inner Layer — Metallic Hydrogen Gas*

Except for the core, Saturn is made of lots of gas. One of the inner layers of Saturn is made of a gas or liquid called hydrogen (when it is hot and deep inside the planet there is no difference between gas and liquid). Don't forget we are still pretty close to the core of Saturn and it is very, very hot! Saturn isn't very dense because it is made mostly of hydrogen. If you ever got close to Saturn, you could put your hand right through it. Remember, Saturn is not solid like Earth, but a big ball of gas and liquid. You would sink into Saturn if you ever visited it. Scientists want to know more about the gases on Saturn.

*Saturn's Outer Layer — Hydrogen Gas*

We find hydrogen gas in lots of places in the solar system. Not all parts of Saturn move at the same speed. When Earth spins, it all moves together because it is solid. (Remember, the water in the ocean is sloshing around on solid ground!) When Saturn spins, some parts move faster and some parts move slower — because it is made of gas. Isn't that surprising?

*Saturn's Neighbors*

Saturn is not in space all by itself. Many icy, frozen moons orbit around Saturn. Some of the moons are in the rings, but most of them are a little farther from Saturn. Earth has only one moon, but Saturn has more than 60 moons. It's kind of crowded up there with all those moons. Saturn's biggest moon is named Titan.

Can you think of something else that is in the sky? (Hint — we see them twinkle at night.) Stars! The stars are really far away from Saturn, but we can still see their light as they shine in the sky.