All About Titan and the Huygens Probe

Artist's concept of the Huygens probe at Titan.

LESSON TIME

1-1/2 hours or two 45-minute sessions

MATERIALS CHECKLIST

For the teacher:

- *Copy of "Memoirs of a Spacecraft" read-aloud passage*
- *Overhead transparencies — Huygens Probe Components drawing; "Note-Taking for Nonfiction Worksheet"; "All About Titan and the Huygens Probe" article (optional)*

For each student:

- *Copies of "All About Titan and the Huygens Probe" article; Huygens Probe Components drawing; "Note-Taking for Nonfiction Worksheet"; "Summary Tips Worksheet"*
- *Pencil, writing paper, drawing paper*
- *Saturn Discovery Logs*

TO SEE EXAMPLES OF STUDENT WORK, CLICK HERE

LESSON NO.8

- *Language Arts Focus — Nonfiction Writing Practice: Summary*
- *Science Focus — Building Mission Background Knowledge*

OVERVIEW

This lesson focuses on Saturn's largest moon, Titan — what we know now and what we hope to discover. Students are introduced to Titan and the Huygens probe in two different ways. First, they listen to a narrative "told" by the Huygens probe entitled "Memoirs of a Spacecraft." Visualization and drawing are used as motivators to enhance comprehension and to get students thinking about Titan and what we might find there. (Students draw what they envision the surface of Titan might look like.) Next, students will read a factual article entitled "All About Titan and the Huygens Probe" and write a summary.

WHY THIS WORKS

This activity gives students practice in both reading and writing for authentic purposes. When summarizing, students are required to choose the most important information and organize that information. Summarizing helps develop and strengthen comprehension (Rinehart, Stahl, and Erickson, 1986; Taylor, 1982). Good readers are also required to build mental images as they read most texts and in most reading situations. The mental images formed may include visual, auditory, or other sensory associations that the reader may have related to the text. The use of these images helps deepen and enhance the reader's understanding (Oczkus, 2000).

Objectives

Students will:

- Extend and enhance their understanding and knowledge about Titan and the Huygens probe.
- Read for a specific, authentic purpose.
- Practice writing a summary.

Teacher Preparation

- For yourself: print out one copy of teacher reference 2, the "Memoirs of A Spacecraft — The Huygens Probe Approaches Titan" teacher's read-aloud passage (3 pages).
- Print out and make a copy of student handouts 1, 2, 3, and 4 for each student:
  — Huygens Probe Components drawing
  — "All About Titan and the Huygens Probe" article (5 pages)
  —"Note-Taking for Nonfiction Worksheet" (2 pages)
  — "Summary Tips Worksheet"
- You might want to make transparencies of the 5 pages of student handout 2, "All About Titan and the Huygens Probe," and read the pages to or with the whole class.
- Make overhead transparencies of student handouts 1 and 3: the Huygens Probe Components drawing and "Note-Taking for Nonfiction Worksheet" (for modeling).
- If desired for discussion, make for yourself a copy or transparency of student handout 4, "Summary Tips Worksheet."
- Distribute pencils, writing paper, and drawing paper to the students.

What to Do

Visualizing — Suggested time 15 minutes

1. Say to students: As you know from the booklet about Saturn's moons you read in Lesson 5, the Cassini spacecraft will drop a special robot spacecraft called the Huygens probe onto the surface of the moon Titan. Scientists are hoping that the probe will collect information that will help answer many questions about Titan, such as "What is the surface like?"
2. Tell students: You are going to be listening to a piece of descriptive writing that is a combination of fiction and nonfiction. It is a story written from the point of view of the Huygens probe. We know that the probe is not alive, so this part of the story is fiction. However, you will also be hearing actual scientific information about the Cassini–Huygens mission and about Titan. As you listen to the story, close your eyes or put your head down on your desk, and imagine what you might be seeing if you were the Huygens probe. After the story is over, you will draw what you think the surface of Titan looks like. We'll keep our drawings in our Saturn Discovery Logs, and as we learn new information from the Cassini–Huygens mission, we will make changes to our drawings as new data comes in.
3. Read the "Memoirs of a Spacecraft — The Huygens Probe Approaches Saturn" teacher's read-aloud passage to students once or twice. Direct the students to listen for details and descriptions that will help them with their illustrations.
4. Have them sketch/draw after you read.
5. Give students time to share their drawings with partners and/or the class.
6. Post their drawings, or direct the students to put them in their Saturn Discovery Logs.

Next Session or Next Day

Huygens Probe Teaching Passage — Suggested time 30 to 40 minutes

1. Explain to the students that: We will continue to deepen our understanding of Saturn and the Cassini–Huygens mission by turning our focus to Titan.
2. Tell the students that they will be reading to learn about this fascinating moon and why it was selected as the destination for the Huygens probe. Also, mention that they will be collecting information, or taking notes, in order to write a summary that will help them when they design their own parachuting probes. Pass out copies of the Huygens Probe Components drawing for background.
3. Pass out copies of the "All About Titan and the Huygens Probe" article and preview with the whole class, using the "Note-Taking for Nonfiction Worksheet."
4. Model by reading aloud the first paragraph of the "All About Titan" article and filling in section 3 of the "Note-Taking for Nonfiction Worksheet": "What's Important" and "What's Interesting" chart.
5. Give students time to complete reading the passage silently, or aloud with a partner, or whole class. Have them fill in the "What's Important / What's Interesting" chart on their copies of the worksheet.
6. Have students share their charts with a partner, or, if they have worked with a partner, have pairs share. Circulate while they do this to monitor that the charts have been done accurately.

teacher TIP

Ask students to write down predictions of what they think will happen to the Huygens probe. Save the predictions and compare them with actual data that will come from the mission.

From Notes to Summary — Suggested time 20 minutes

1. Distribute and read the "Summary Tips Worksheet" with the students. Check for understanding.
2. Have students write the writing goal for their summaries on the tops of their papers.
3. Give students time to write. Encourage them to use the notes from their "Note-Taking for Nonfiction Worksheet."

Sharing — Suggested time 10 minutes

1. Student volunteers can read their summaries aloud.
2. Have the class, or teacher, identify what makes these summaries effective.

Writing Questions in Saturn Discovery Logs — Suggested time 15 minutes

1. It is important for students to understand that scientists change their ideas based on new evidence or data. Also, students need to understand the importance of asking questions.
2. Read the following list of "open issues" about Titan aloud to the students, and have them record any of these, and any of their own questions in

their logs. Which questions do they think will be answered by the Cassini–Huygens mission?

- Are there liquids on Titan's surface?
- Is the interior still hot?
- Why does Titan have a dense atmosphere while the other large moons do not?

teacher TIP

Students could select one of Saturn's moons that they would like to send a probe to investigate, and then write a persuasive essay to convince a review board to fund their mission.

Extensions

1. A Topographical Map of Titan

Unveiling Titan's Surface is a NASA Educational Brief in the "Cassini Science Investigation" family (the identifying number is EB-2001-12-006-JPL). It can be downloaded and printed from *http://saturn.jpl.nasa.gov/education/edu-58-kitchen.cfm* (under "Saturn System Science"). In this hands-on activity, students build a model planetary surface inside a shoebox using green styrofoam. Students make measurements of topographic features and draw maps based on these data. This activity is analogous to the radar measurements and mapping that will be done at Titan. The grade-level range suggested is 5–12, but it can be adapted for younger students by simplifying the mapping activity.

2. Investigate Saturn's Other Satellites

Saturn has over 30 known moons! An excellent activity for comparing the moons can be found in NASA's *Saturn Educator Guide* (EG-1999-12-008-JPL). A PDF can be downloaded from *http://saturn.jpl.nasa.gov/education/edu-58.cfm*. Click on *Saturn Educator Guide*, then "Saturn's Moons" (Lesson 2). The lesson was designed for grades 5–8; here are instructions on how to adapt the "moon card" activity for younger students.

- Print and laminate copies of the moon cards for pairs of students. Have the students group the moon cards in at least three different ways, then ask them to describe the criteria they selected for each of their groupings.
- Have the students observe the cards closely, and write a "show not tell" descriptive paragraph about a moon of their choice. Have students read their paragraphs aloud, and let the class/peers guess which moon they have described.
- Create a class poster or bulletin board using the images of the moons. Have students write "I notice" (observations) and "I wonder?" (questions) on notes and post on the board.
- Students can select a moon that they would like to learn more about. A writing piece might be a short report of information. It could also be a poem. Students could even write fictional autobiographies, and pretend that they are one of the moons.

Assessment

While students are working, ask yourself the following questions:

1. Are they including information from the read-aloud in their drawings, and adding their own ideas as well?
2. Can they clearly explain the different parts of their drawings?

As you read over the students' work, ask yourself the following questions:

1. Do their notes and summaries indicate that they understand the difference between main ideas, details, and examples?
2. Does their writing show evidence that they understand the content of the article? (e.g., are the main features of the probe explained?

Standards

National Council of Teachers of English and International Reading Association Standards for the English Language Arts

All students must have opportunities to:

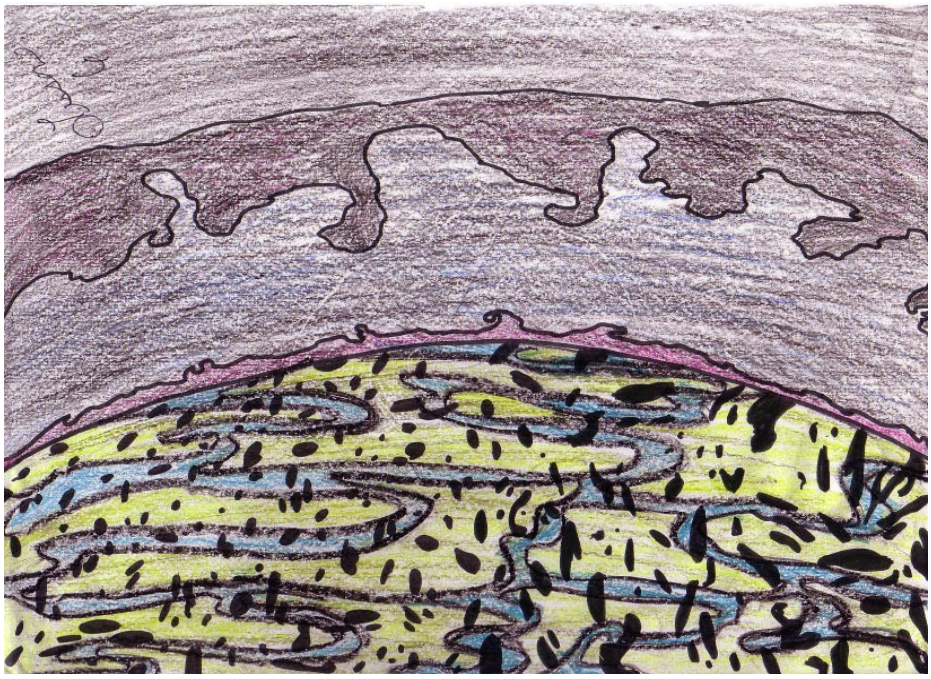
- Participate as knowledgeable, reflective, creative, and critical members of a variety of literacy communities.
- Use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).
- Apply knowledge of language structure, language conventions, figurative language, and genre to create, critique, and discuss print and nonprint texts.

National Science Education Standards

As a result of their activities in grades K–4, all students should develop understanding:

- Of objects in the sky (Earth and Space Science).
- About science and technology (Science and Technology).
- Of science as a human endeavor (History and Nature of Science).

Example of Student Work

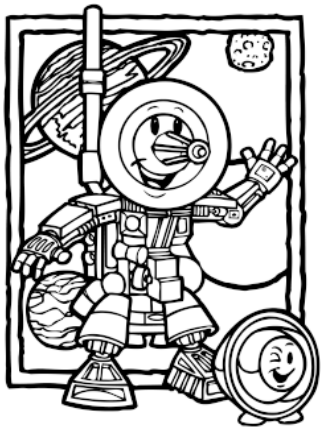


Student concept of surface of Titan

Teacher's Read-Aloud Passage

Memoirs of a Spacecraft — The Huygens Probe Approaches Titan

December 25, 2004



More than seven years and two billion miles ago, spacecraft Cassini and I bid farewell to the powerful rocket that carried us from Earth to outer space.

We're pretty big, Cassini and I — about as big as a school bus — and no rocket is big enough to send us straight to Saturn. So we needed to take a roundabout route, one that would allow us to whip around Venus and Earth and Jupiter on our way, so the gravity of those planets could give us the extra speed we needed. It worked really well, and we got to see some amazing sights along the way. Jupiter was awesome!

By the time we passed by Jupiter, we were traveling at an incredible speed — 50,000 miles per hour! If you could go from San Francisco to New York at that speed, it would only take you three minutes!

We might have zipped right past Saturn if it weren't for our rockets. They were aimed in front of us, to slow us down. It was very tricky! If they slowed us down too much, we would be pulled into the giant planet. If they didn't slow us down enough, we would zoom past Saturn and never be able to come back! So the rockets had to be programmed to switch on at precisely the right moment, with exactly the right amount of power, for just the right amount of time.

The rockets burned for 90 minutes straight, before slowing us down enough for Saturn's gravity to pull us into orbit. That initial jolt when the rockets first fired sure surprised me, even though I knew it was coming. Imagine how you might feel running into a brick wall!

But it didn't amaze me nearly as much as what happened next. As we began to orbit Saturn, we flew right through a gap in the rings, then across to the other side of the planet, and then right through the same gap on the other side of the rings. Now that's fancy maneuvering!

After three orbits around this beautiful ringed planet, my time to say good-bye to Cassini is almost here. I remember talking to Cassini when we first reached Saturn, back in July of 2004 —

> "Here we are, Cassini," I said. "We're finally at Saturn! Can you see the bands of color — white and yellow and brown— across the globe? They seem to be storm clouds riding and playing on the wind. Now the rings around the equator are shining brighter than ever. For so long they've looked like silvery bands, or a halo. But at this close distance, I can see that the rings are not solid bands at all! They're a dense ribbon of icy pebbles and sand and gravel and boulders lying in a path around the planet's middle, as if they were racing around Saturn on a gigantic track. Some of the pieces are finer than dust, some are bigger than a house, and others are every size in between! Some of those ice-covered rocks look like chunks of chips and nuts in frozen white cookie dough. I'm thrilled to finally be here, Cassini. But I'm a little sad, too, because in six short months I'll be leaving you. I'll continue on by myself to the mysterious world of Titan."

Well, those six months have passed, and now the time for me to go to Titan is here! I'll be the first machine from Earth to land on that giant moon. I like the fact that I was named after the astronomer who discovered Titan. His name was Christiaan Huygens, and he lived in the Netherlands. He spotted Titan in 1655 — more than 300 years ago! — using a telescope he had built himself. Now I will uncover some of the mysteries that have puzzled people ever since then. What will I find beneath those thick clouds? Will anything be like it is on Earth? I wonder!

I do know a few of the things I can expect to find. There will be gravity, though not nearly as strong as the gravity on Earth. In fact, I'll weigh just one-seventh of what I weighed back on my home planet.

My elder cousins, the two Voyager spacecraft, took more than 1,000 photographs of Titan when they paid a short visit to Saturn years ago. Their cameras were not able to see through Titan's dense atmosphere, but they did learn some very interesting things. Scientists already knew that Titan's atmosphere is mostly nitrogen, just like Earth's. But the Voyagers' infrared and ultraviolet cameras revealed that there is also methane and hydrogen in the atmosphere, as well as many other chemicals.

The Voyagers also measured Titan's size — it's 3,200 miles across. That's less than half as wide as Earth, but much bigger than Earth's moon. In fact, Titan is the second biggest moon in the entire solar system! The Voyagers also measured Titan's temperature, and found that it's about 289 degrees below zero on the Fahrenheit scale. That's much colder than anyplace on Earth — even the North and South Poles! And the Voyagers also learned that Titan's atmospheric pressure is 60 percent greater than Earth's. That's about as much pressure as a diver back on Earth would feel under 20 feet of water.

To tell you the truth, I'm just a bit nervous about this journey I'm about to take. When Cassini releases me, I'll be on my own for the first time, traveling through space and then down through Titan's atmosphere. But I'm excited, too. It's going to be a great adventure!

My onboard instruments have been carefully programmed, and they were tested numerous times on Earth. Will they still work after seven long years? And when I send my radio messages to Cassini, and Cassini passes them along to my trusted team of engineers and scientists back on Earth, will they arrive? Earth is so very, very far away — the radio signals will be incredibly faint by the time they get there. Well, we're about to find out!

I'm sure thankful for my special heat shield, which will save me from being burned up when I enter Titan's atmosphere. Then my parachutes will open, and — if there is no great and wild wind in that mysterious atmosphere — I'll drift slowly down to the surface.

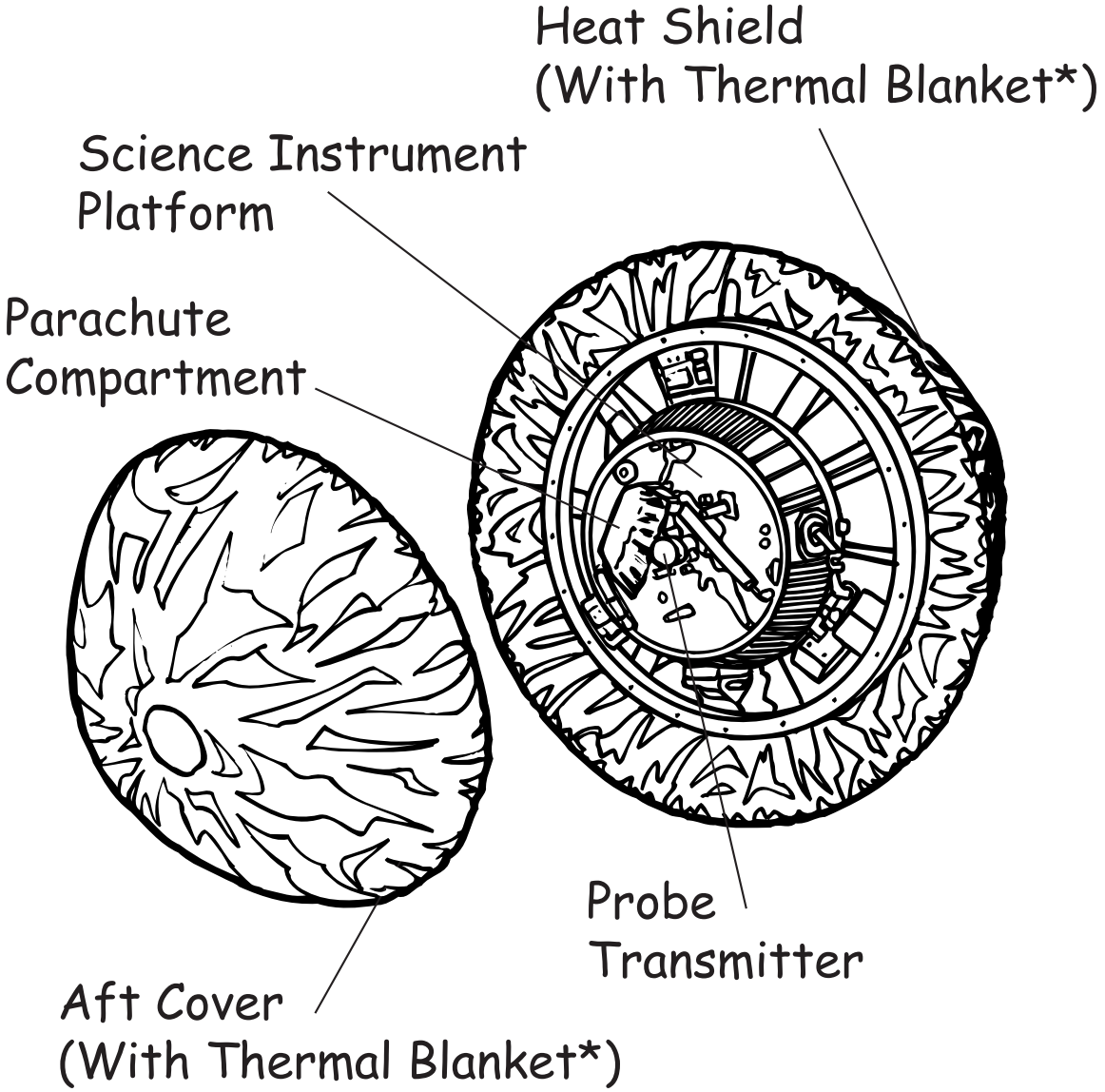
One of my tasks will be to measure the sunlight that strikes this moon. We're so far from the Sun and Titan's atmosphere is so thick, I wonder what the light will look like on the surface. Perhaps it will be dim all around. Perhaps I should expect something altogether different.

I wonder what Titan's surface will be like? Is a rocky moon hiding under the haze, with mountains and broad valleys, crags and ridges, grand flat plains stretching to the horizon? Or will I fall into a liquid world with swirling wave patterns in a giant sea? Or will the surface be somewhere in between — like slush or mud? Will it swallow me up as soon as I touch down?

I will soon find out. There is Titan now, rising from the edge of the rings as a great ball of light.

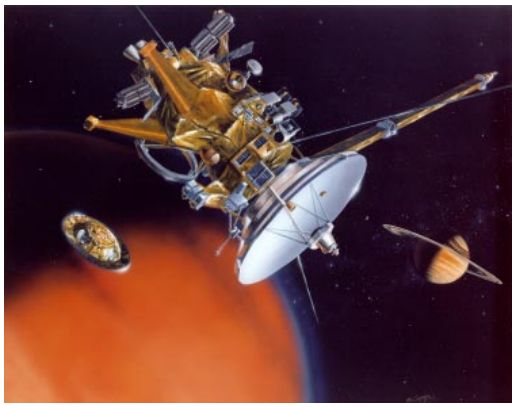
Farewell, Cassini. May you learn well. I go to an unknown world.

Huygens Probe Components



*The protective thermal blanket is a layered material known as multi-layered insulation or MLI.

All About Titan and the Huygens Probe



On January 14, 2005, the Huygens probe will descend to Saturn's largest moon, Titan. The probe will have traveled for seven years, carried on the Cassini spacecraft through millions of miles of space, to complete the work it will do during the next couple of hours.

Huygens is a robot, which means that it's a machine that has been programmed to operate on its own, without the need for a human being to control it. Huygens will take pictures and make measurements of Titan's atmosphere and surface, and send these pictures by radio to the Cassini spacecraft, which will be in orbit around Saturn. Cassini will relay the pictures and scientific measurements to us, here on Earth.

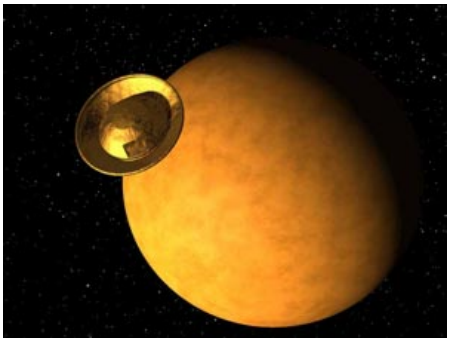
Imagine that you're riding along with Huygens as it cruises to Titan and takes a 2-1/2-hour parachute ride down through the atmosphere! Huygens' descent module (the part of the spacecraft that will actually float down to Titan's surface) is just a little more than four feet across, and it's filled with scientific instruments. But imagine that you could somehow squeeze inside the module and look out through a window. You're about to see sights that no one has ever seen!

Before you enter Titan's murky, reddish atmosphere, take a last look around at the view from space. The Sun looks much smaller and dimmer than it did from Earth, because it's almost 10 times farther away. The sunlight that reaches you is 90 times weaker than it is back home.

Nearby Saturn is big and beautiful — 12 times bigger than a full Moon appears as seen from Earth! But you're seeing just the edge of its rings, so they don't look as spectacular as they did from a better angle. Some of Saturn's 31 other moons dot the blackness of space.

You're weightless as you coast to Titan. If there were room inside Huygens, you'd be floating around inside.

Titan fills the sky in front of you. It's the second-largest moon in the entire solar system (Jupiter's Ganymede is slightly larger), bigger than the planets Mercury and Pluto! If Titan weren't in orbit around a planet (which makes it a "moon"), it would surely be considered a planet.



You blaze into Titan's atmosphere at almost four miles per second! Huygens' heat shield pushes hard against the air as you fall, which is like slamming on the brakes. During the next two minutes, you slow down to "only" a quarter of a mile per second. This sudden change in speed makes you weigh more than 300 pounds!

Then a parachute pops out, the heat shield comes off and falls away, and you begin to float down through Titan's atmosphere. You feel very light again, but not weightless as you were in space.

TITAN'S ATMOSPHERE

Scientists think that Titan's atmosphere may be like the one that Earth had millions of years ago, before life began to form. Studying Titan might help us learn about the early days of our own planet, and the conditions that led to life developing on Earth.

As the probe descends through the atmosphere, the scientific instruments inside Huygens spring into action! One collects tiny samples of the air, and identifies the gases in it. (We know that Titan's air doesn't have the oxygen you need to breathe. So, on your imaginary journey, you'd better bring some imaginary oxygen tanks!)

Special cameras look up, down, and sideways. Some look at the "regular" light that our eyes can see — called "visible" light. Other cameras look at light that our eyes can't see on their own, called "infrared" (in-fra-RED) light, and these cameras can see it just like you could if you were wearing night-vision goggles.

One camera is pointed toward the distant Sun. Huygens can tell how much dust and vapor is floating around in the air, and how big those particles are, by measuring how the atmosphere affects the sunlight.

The probe is designed to spin as it falls, so its cameras can look all around. Watching the clouds glide by as you turn makes you a little dizzy, so you close your eyes. And then your eyes pop open! Was that a flash of lightning? Do you hear a familiar rumbling sound in the distance? If so, Huygens will tell us about it. It even has a microphone to pick up the sound of thunder.

You can't see the surface yet, but you can tell that you're not falling straight down. A powerful wind — as strong as some of the fastest hurricane winds on Earth — is blowing you to the side as you fall! Don't worry, Huygens' designers expected this. The probe has several instruments to measure this sideways motion, so scientists can figure out which direction the wind is blowing, and how strong it is at different elevations (heights above the ground).

One instrument is called the Doppler Wind Experiment, and it uses something called the "Doppler effect." You've heard the Doppler effect on the street. The sound of a fire engine's siren has a higher pitch when it's coming toward you than when it's moving away. Listen carefully next time you hear a siren to see if you can tell where the fire engine is by the way the siren sounds.

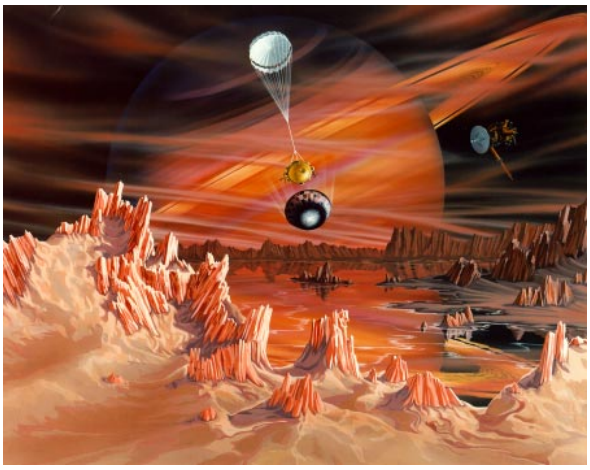
The Doppler effect is useful for science because of what it can tell us about how a radio signal changes and what it means. Huygens is sending a steady radio signal to the Cassini spacecraft. Cassini receives the signal at a higher frequency if Huygens moves a little bit toward Cassini, and a lower frequency if it moves slightly away from Cassini. These tiny changes in the radio signal reveal how the probe is being blown by wind.

You may not have noticed it, but another instrument aboard Huygens can tell that you're not falling as fast as you were a few minutes ago. The atmosphere must be getting denser. That means the molecules that make up the air are packed closer together at this height, so they're a little harder for the probe to fall through.

A DENSITY EXPERIMENT

Try this experiment: Hold a coin just at the top of a glass full of water, and another coin at the top of a glass full of nothing but air. Then let them go at the same time. Which takes longer to fall to the bottom of the glass? Denser air will slow Huygens' fall, just as the water, denser than air, slows the coin as it falls.

As you continue to descend, Huygens measures the atmosphere's temperature and pressure, seeing how they change as you get closer and closer to the surface. Another sensor measures how much sunlight is shining down through the hazy atmosphere, and how much bounces back up after hitting the surface.



With only a thousand feet left to go, an infrared lamp switches on to light up the surface for the downward-looking cameras. What do you think you'll find there? Will the surface be solid, liquid, or something in-between? You're about to become the first person in history to find out!

Suddenly you feel a jolt, and you know that you've hit the surface! You're the first person on Titan!

One of Huygens' instruments measures how suddenly you stopped, which tells us how hard or soft the surface is. Are you on dry land, perhaps near a volcano or geyser spewing methane gas into the air? Are you bobbing around in an ocean of liquid methane (kind of like alcohol)?

You notice that you have weight, though not nearly as much as on Earth. If you weigh 70 pounds back home, you weigh less than 10 pounds here on Titan!

If Huygens' instruments still work after the probe has hit the surface, they analyze the surface material. If you splashed down in a lake or ocean, Huygens uses sound waves to measure how deep it is, and it also measures the wind and waves that carry you along.

Huygens' thermometer tells you that it's cold outside — about 300 degrees below zero Fahrenheit! That's far colder than the coldest night at Earth's North Pole!

Now that you're on Titan, looking up at the sky, you're kind of glad you don't have to breathe that air. It's worse than the smoggiest day you've ever seen! This looks nothing like the Earth you know. But you wonder — are you seeing a

STANDING ON TITAN

Titan is the only moon that you could stand on without a space suit. (Although you would need a tank of oxygen to breathe and heated clothing to keep you warm.) You see, our bodies are designed for Earth, which has a big atmosphere. The weight of all that air pushes in on our bodies from every direction. You'd be flattened like a pancake if not for one thing — the inside of your body pushes out exactly the same amount that the outside atmosphere pushes in! As long as the pushing from inside our bodies is just the same as the pushing from outside, we're nice and comfortable.

But what would happen if there were no atmosphere to push in on you (for example, if you were out in space)? There would be nothing to balance the force pushing out, and you'd blow up like a balloon! That's why astronauts need space suits. Space suits replace the pushing (or pressure) of Earth's atmosphere. You could stand on Titan without a space suit because Titan has an atmosphere with about as much pressure as Earth's (actually, a little more!). That's something you couldn't do on any other moon in the solar system — or even on Mars, Mercury, or Pluto.

world that's something like Earth was millions of years ago? Will the information that Huygens is sending to Earth help us learn how life on our planet began?

But now Huygens' batteries run out of electricity, and the little robot stops working. Because it's a machine, it can stay on Titan forever, and never miss being on Earth.

And you? Well, unless you've brought along a whole lot of oxygen, food, water, very warm clothing, and an extra spaceship to bring you back home, you've got a problem!

Maybe it's lucky after all that when Huygens really visits Titan, it will travel alone. But in a way, with this trusty robot serving as our eyes and ears, you and all the other people of Earth will be the first explorers on Titan!

Note-Taking for Nonfiction Worksheet

1. Preview the article you will be reading. Look at the title, headings, and illustrations. Think/write about what you already know, questions you have, and predict what you will learn. You can write in your Saturn Discovery Log. You can write more than one response for each question or statement!

What I already know: _____

I think I will learn: _____

I predict: _____

Questions I have right now:

I wonder _____

I wonder _____

I wonder _____

2. Read the article. Jot down ideas that are important for the type of writing you are going to do: details if you are writing a description, important big ideas if you are writing a summary, etc. Remember, for taking notes don't write more than 5 words for any one idea!

_____

_____

_____

_____

_____

Note-Taking for Nonfiction Worksheet contd.

3. Read through your notes, and scan the article again. Choose ideas for the chart below.

What's Important (Themes, Main Ideas, BIG Ideas)	What's Interesting (Amazing, cool, fun, weird, surprising, but NOT the main idea)

Summary Tips Worksheet

1. Tips When You Are Reading a Summary

- The purpose of a written summary is to help the reader, and often also the writer, identify and remember the most important information from a piece of writing.
- Different kinds of writing have different structures or patterns.
- Knowing the structure of the writing you are reading will help you to summarize the information.

2. Tips When You Are Writing a Summary

- A summary will help you to remember the most important parts of what you read.
- Take out the information that is not important for your understanding.
- Replace lists of things or separate details with one word that describes things in that list.
- Write or find a topic sentence.
- A summary reports the information you find in a piece of writing. A summary paragraph should not include your opinion(s) about the topic, nor does it need a conclusion.

3. Try the summary technique yourself!

Write a topic sentence using the following technique, or another that you like:

Article Title	What it Does:	
"All About Huygens and the Titan Probe"	tells.... describes.... explains.... shows....	all about the Huygens probe and its expedition to Titan

Try a couple of different topic sentences using the "What's Important" and "What's Interesting" chart. Pick the one you think is best, and rewrite it.

Now ...
1. Look back at your notes, and create an outline or cluster.
2. Use your outline to write a paragraph.
3. Re-read your paragraph to yourself, and read it out loud to a partner. Be sure it makes sense!