

Memoirs of a Spacecraft

The Huygens Probe Encounters Titan

December 25, 2004

More than 11 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!

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 moon called Titan."

January 2005

After three orbits around the beautiful ringed planet, Saturn, my time to say good-bye to Cassini is almost here. I'm the first machine from Earth to land on Titan. I like the fact that I was named after the astronomer who discovered this giant moon. 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.

I can tell you about some of the things I know about Titan. It has gravity, though not nearly as strong as the gravity on Earth. In fact, I 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 pictures of Titan when they paid a short visit to Saturn years ago. Their cameras were not able to see through Titan's dense haze and clouds, 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 any place 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.

Now I will uncover some of the mysteries that have puzzled people ever since then. What will I find beneath those thick clouds? My partner Cassini has found some astonishing things about Titan's surface. In some amazing ways, it is like my home Earth. There are riverbeds and huge deserts covered in dunes and even lakes. But it is so cold here, so much farther away from the Sun, and it is made so differently, that I expect it will not be like Earth in many ways. I have to get closer and see for myself.

To tell you the truth, I am just a bit nervous about this journey. When Cassini releases me, I will be on my own for the first time, traveling through space and then down through Titan's atmosphere. But it's exciting, too. I'm having a great adventure!

Some things concern me about my mission once I arrive at Titan. My onboard instruments have been carefully programmed, and they were tested numerous times on Earth. But 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.

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January 14th, 2005

Well, I've been sending pictures and information for a while now!

I'm sure thankful for my special heat shield, which saved me from being burned up when I entered Titan's atmosphere. Then my parachutes opened, and — because there is no great and wild wind in that mysterious atmosphere — I drifted slowly down to the surface.

I wondered what Titan's Earth-like surface would look like up close. And now that I'm here, I realize that, as much as Titan is like Earth, it is also extremely different. I am so excited to share what I see with my team on Earth that I am sending back images as fast as I can. My other instruments have sampled the atmosphere and I'm sending back that information too.

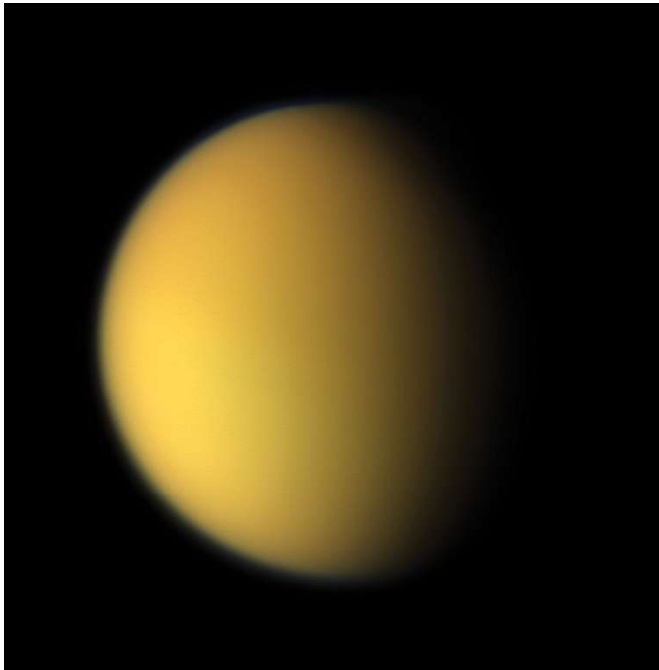
It is so cold here that, while I do see rocks, those on Earth are made of silicate, but the ones here are made of water ice. There are lakes and rivers here, and on Earth they are made of liquid water, but here, they are made of liquid methane. On Earth, methane is usually a gas but here in the cold it is liquid. On Earth, desert dunes are made of sand but here; they are formed from the dark hydrocarbon grains that drift down from the atmosphere.

What a remarkable world. My team of scientists and engineers must be so excited by my findings. I wish I could be there to celebrate with them. I wish they could be here to celebrate with me. Will that ever be possible?

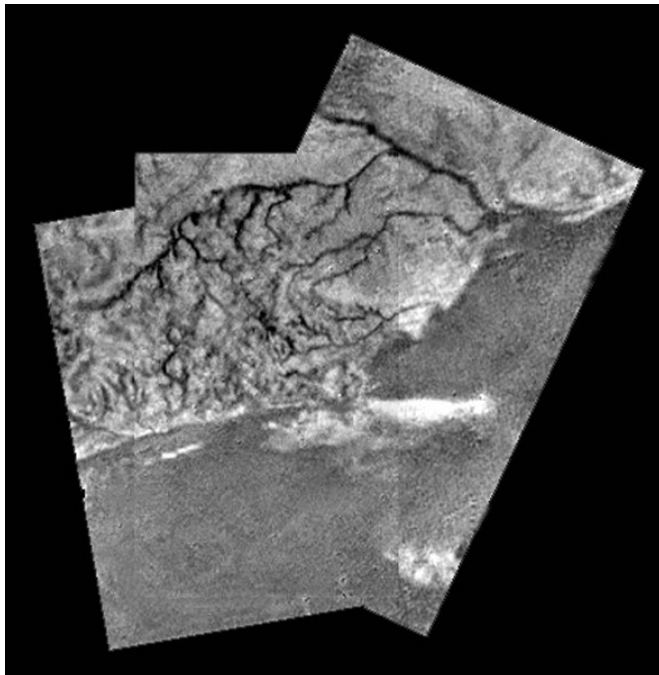
My job is now done and my partner Cassini will continue my work by flying close to Titan many times to continue my discoveries. Thanks for bringing me to such an exciting place, my friend.



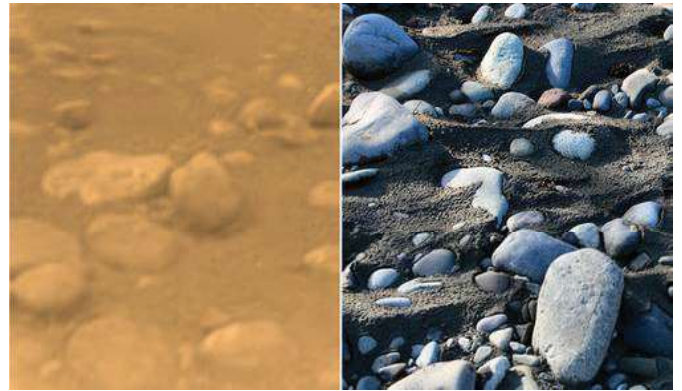
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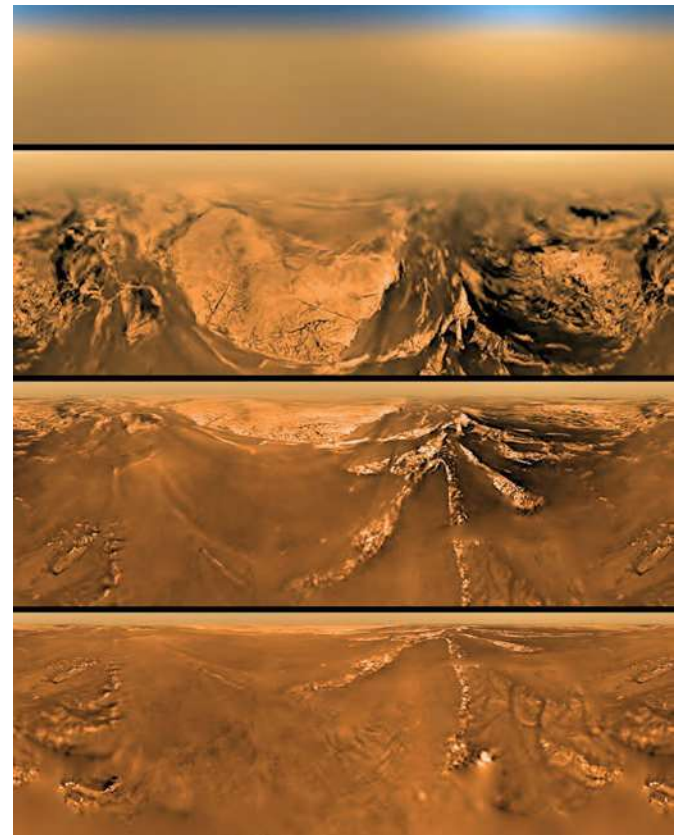
Haze on Titan hides the surface below
(Cassini image)



A flowing river channel on Titan
(Cassini image)



Rounded rocks on Titan (left) and Earth (right)
Credit: NASA/JPL/ESA/University of Arizona and S.M. Matheson



Huygens Probe views of Titan as it descends to surface