Titan's Big News: A Mysterious Shoreline

James Estrin/The New York Times

Visitors streamed to the American Museum of Natural History to see live images from Saturn's moon Titan, discussed by Dr. David Grinspoon. Nearby was a meteorite found in Oregon.

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DARMSTADT, Germany, Jan. 15 - New pictures of Saturn's moon Titan and other observations show that the Huygens spacecraft landed on a spongy surface like wet sand or soft clay, possibly saturated with liquid methane. The sky was orange, with patches of ground fog. Even the fist-size lumps of ice were a dusty orange. Beyond the site, deep drainage channels appeared to lead to a shoreline in the distance.

But a "shore" to what? Scientists, in their first reports on Saturday on results of the successful Huygens landing, said the flat, dark area beyond the bright drainage terrain might still hold hydrocarbons, presumably methane, that

can remain liquid even in Titan's climate of minus 290 degrees Fahrenheit. Or the basins may have been drained empty - a lake that was, and could be again.

"This is a view, an aspect of Titan we had never seen before," Dr. Martin Tomasko of the University of Arizona, leader of the imaging team, said at a news conference here at the European Space Operations Center.

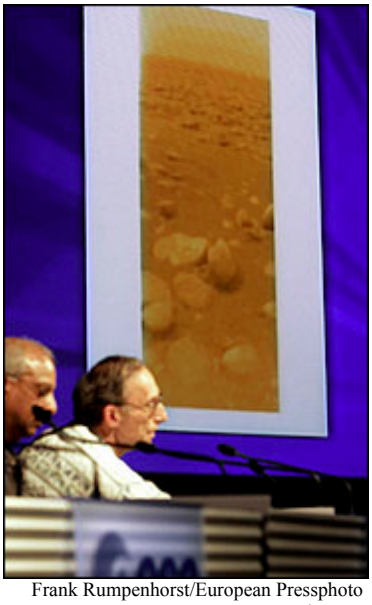
The European-built Huygens descended through the dense atmosphere and touched down on the largest and most mysterious moon of Saturn on Friday. A recording of the sound of Huygens plunging through the ever denser air, as reconstructed from sensor data, was played at the briefing. A pilot on board would have heard the howling of a terrible windstorm and, just before landing, the beat of radar signals searching for the surface.

After a two-and-a-half-hour descent by parachutes, the craft kept sending back science data and images for 1 hour and 10 minutes on the surface - about what scientists had hoped for, but they would have been happy to settle for less. All the sensors for surface studies were reported to have performed normally for the duration of operations.

But a loss of one of the two communications channels for transmitting data to the Cassini mother ship reduced the number of pictures to 350, from a planned 700. Data on wind speeds on Titan were also lost, but radio astronomers said the observations may yield indirect evidence of the wind strength.

"That's the cosmos reminding us that we are just human," said Dr. David Southwood, the European Space Agency's director of science programs, who has ordered an investigation of the cause of the data loss. Most of the information was saved because duplicate sets were transmitted on the two channels.

After working through the night examining the pictures and data, said Dr. Jean-Pierre Lebreton, the Huygens mission manager for the space agency, "We have achieved all our objectives and probably more, and can now see a clear picture of Titan emerging."



Frank Rumpenhorst/European Pressphoto Agency.

New, refined pictures from Saturn's moon Titan released today show a pale orange surface covered by a thin haze of methane and what appears to be a methane sea complete with islands and a mist-shrouded coastline. Dr. Martin Tomask, right, with Dr. Sushil Atreya, discussed new images of Titan's surface yesterday.

Dr. Tomasko said further studies in the next weeks may explain the unknown nature of the dark regions that could be lakes or just flat surfaces of dark material. An examination of the reflectivity of light from the dark surface areas is expected to identify the signatures of the materials in the "lakes."

The distribution of the rocklike frozen objects surrounding the spacecraft indicated that "they were perhaps moved by liquid flow," Dr. Tomasko said.

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He speculated that some of the dark features may prove to have been "wet not so long ago."

In an interview, Dr. Laurence A. Soderblom, a planetary scientist with the United States Geological Survey, said: "I'm struck by how flooded the surface looks. All the channels in the light areas flow from one dark area to another dark area."

If this evidence of possible liquids on Titan's landscape is confirmed it would support widely held pre-mission conjecture that the planet-sized moon has lakes and perhaps seas of liquid methane or ethane. It could thus prove to be the mission's most consequential discovery: that not only is Titan the only moon in the solar system with a substantial atmosphere, but it also appears to have flowing surface liquids, putting it in the company of only Earth and possibly Jupiter's moon Io, with its lava flows.

Another hypothesis has been that frozen water is also a significant component of Titan's surface, because the moon's mass would be greater if not for a considerable amount of water ice. The first pictures appeared to show that some of the ice lies in chunks on a surface that may be underlain with deeper layers of ice.

Previous studies of Titan's atmosphere showed the existence of complex hydrocarbon chemical processes, with methane the second-most-abundant constituent, after nitrogen. Huygens's atmospheric measurements revealed that methane molecules increase just above the moon's surface, possibly the result of evaporation. Dr. Sushil Atreya of the University of Michigan, a member of the research team, said that "presumably there is a reservoir of methane on the surface."

Dr. John Zarnecki of the Open University in England, leader of the surface science observations, said instruments sent back sharp spikes in their data that marked the moment and force of Huygens's impact. From this his team inferred the consistency of the surface at the landing site: wet sand or soft clay.

Among the first pictures to be made public, only one has been processed to show the orange hues of sky, surface and scattered ice spheres. At first glance, the litter of rocklike ice looked like the Martian landscape now being explored by the rovers, Spirit and Opportunity.

The half dozen other pictures just released are raw images, unenhanced by computer processing to highlight contrast. Some pictures were taken as much as 20 miles away and others just before or after the craft landed. Scientists said they had not had time to compare the Huygens images with the pictures taken by the Cassini orbiter on close passes of Titan. The Cassini pictures, limited by the smoggy pall hanging over Titan, also found evidence of the movement of rocks and other material on the surface. But some of the streaks visible near the equator appeared to be signs of windblown erosion.

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