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Huge leap forward for European space exploration as first close-up reconnaissance of a moon in the outer Solar System is successful

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Huygens probe on the surface of Saturn's moon Titan

European research probe Huygens studies the atmosphere of Saturn's largest moon Titan – Germany and Italy are key European players in a complex mission

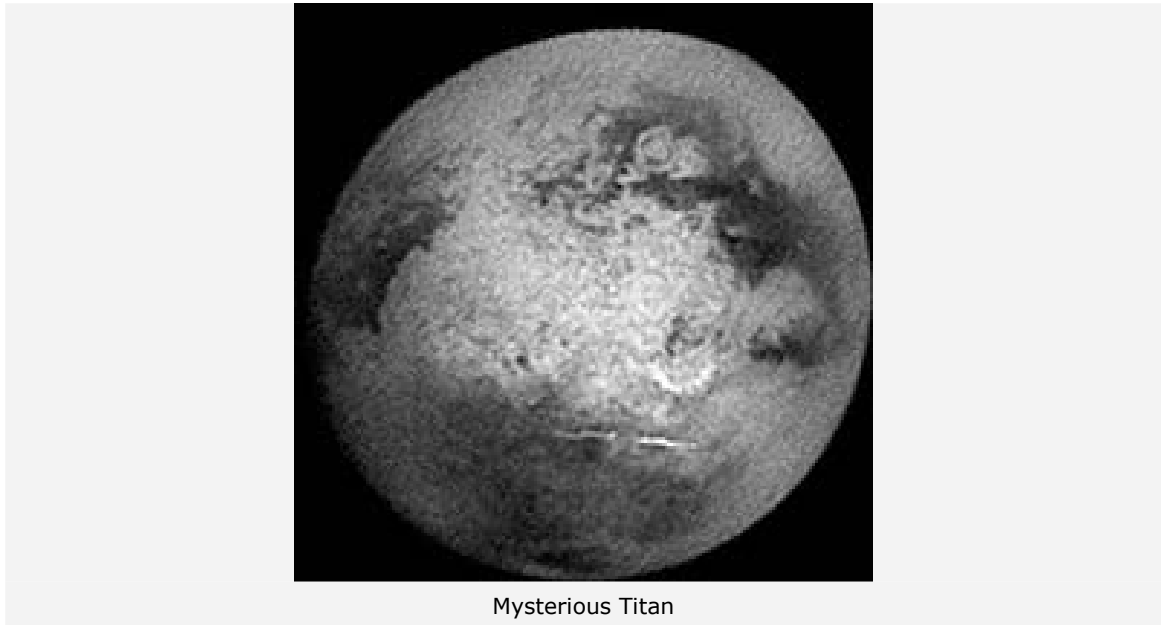
Darmstadt/Cologne - European space exploration has achieved a unique success with the successful descent of the European research probe Huygens through the atmosphere of Saturn's largest moon Titan. Today, 14 January 2005, marks the first occasion in the history of spaceflight on which scientific exploration of a body in the outer Solar System has been successfully accomplished in situ. The descent through the atmosphere of Saturn's moon Titan took around two hours, and during this time the European Huygens probe transmitted scientific data and images as planned. As it descended, the probe was slowed down first by the heat shield and then by the parachute before touching down on the cold surface of the Saturnian satellite.

The probe was not designed to survive on the surface of Titan or for a soft landing, but to investigate Titan's atmosphere. On 25 December 2004, Huygens successfully separated from its American mother probe Cassini. The German Aerospace Centre (DLR) is a major participant in the US/European Cassini-Huygens mission.

Germany plays a role in a wide range of experiments

There are six scientific experiments on board the European Space Agency's atmospheric probe Huygens, while the NASA mother probe Cassini, whose antennae transmit data from the Huygens probe back to Earth, is equipped with another twelve. A number of scientific institutions in Germany are involved in the Huygens mission, including the University of Cologne, the Ruhr-Universität Bochum, the Technical University of Dresden and the Max Planck Institute for Solar System Research (MPS) in Katlenburg-Lindau. The University of Bonn is a leading participant in the Doppler Wind Experiment (DWE).

Huygens is the first probe designed and built in Europe to venture into the outer Solar System. The main contractor was French aerospace group Aerospatiale, while the individual components were put together at EADS Astrium GmbH in Ottobrunn, Germany.



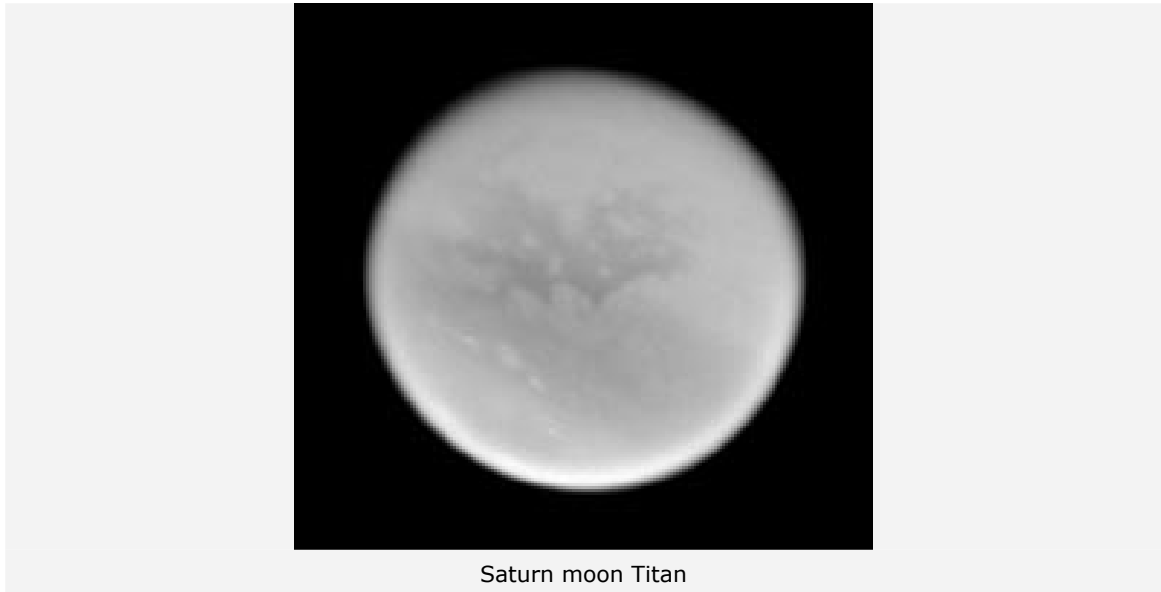
German scientific contribution to American mothership Cassini

The NASA Cassini probe is also equipped with experiments from other German institutions. The most important German contribution comes courtesy of the Max Planck Institute (MPI) for Nuclear Physics in Heidelberg, which is responsible for six experiments on the Cassini mother probe. Using the Cosmic Dust Analyzer (CDA) developed in Germany, the MPI measures the interplanetary and cosmic dust in the Saturn system, an experiment in which the DLR is also involved. The experiment was built at the DLR and tested to ensure that it was compatible with an outer space environment.

The University of Cologne and the Technical University of Brunswick are observing the magnetic fields using the Dual Technique Magnetometer or MAG. The Max Planck Institute for Solar System Research (MPS) in Katlenburg-Lindau is measuring neutral and charged particles within Saturn's magnetosphere (Ion and Neutral Mass Spectrometer or INMS), and in a second experiment is studying Saturn's magnetosphere and its interaction with the solar wind (Magnetospheric Imaging Experiment or MIMI). In a third experiment, the MPS is measuring the ultraviolet spectra of the atmospheres of Saturn and Titan, the rings and the solid surfaces of the moons of the Saturn system (Ultraviolet Imaging Spectrograph or UVIS). The DLR is also involved in this experiment. The University of Wuppertal (Germany) is using the Composite Infrared Spectrometer (CIRS) to gather infrared data about the surfaces, rings and atmospheres in the Saturn system. The DLR in Berlin-Adlershof is producing spectral mapping of the surface structures on Saturn's moons with the Visible and Infrared Mapping Spectrometer (VIMS), while the Freie Universität Berlin is creating high-resolution multi-spectrum images of Saturn and its rings and moons with the Imaging Science Subsystem (ISS). With this camera experiment, the DLR's Institute for Planetary Research in Berlin is providing assistance in the planning of close fly-bys of the moons, in cartography and photogrammetry.

Germany and Italy foremost European participants in Cassini-Huygens mission

Germany's financial contribution to the US/European Cassini-Huygens mission amounts to around €115 million, while the total European costs of the Huygens atmospheric probe come to approximately €400 million. The total costs of the complete NASA/ESA Cassini-Huygens mission amount to approximately \$3.3 billion. In Europe, Germany together with Italy is making the largest financial and scientific contribution to the mission.



Saturn's moon Titan: more a planet than a moon

The Saturnian moon Titan – the ringed planet's largest satellite with a diameter of 5150 kilometres – is a highly complex body in the Solar System. It is larger than the planet Pluto and in many ways more resembles a planet than a moon. It is the only moon in our planetary system with a dense atmosphere, which is one of the reasons why it is of such interest to scientists. Like the atmosphere of Earth, Titan's atmosphere is mainly composed of the gas nitrogen. This is combined with approximately 3% methane and about 1% argon. In 1980 and 1981, the two US Voyager probes had already detected the presence of methane-related hydrocarbons. Because of its enormous size and the low temperatures experienced within the Saturn system, Titan has been able to retain an atmosphere of its own in which organic molecules may even have formed from this methane through photochemical and radiation-induced processes. Scientists are therefore on the lookout for the building blocks of life. Because Titan also has an unusual, young and possibly active surface (in the form of ice volcanoes or 'cryovolcanoes'), the images taken by the descent camera on the Huygens probe may go some way towards puzzling out the geology of this mysterious moon.

Dense atmosphere has always hindered research on Saturn's largest moon Titan

Titan is the only moon in the Solar System with an atmosphere, this dense covering of gas being the reason why, during earlier fly-bys, Voyager 1 (1980) and Voyager 2 (1981) were not able to photograph the surface. In April 1998, water was discovered for the first time with the aid of the European infrared telescope ISO. This observation, particularly when taken together with the most recent measurements taken by the instruments on Cassini during the two close fly-bys on 26 October and 13 December 2004, suggests that we may well discover a varied mix of organic molecules both on Titan and in its atmosphere during the experiments performed by the Huygens probe on 14 January 2005. These molecules could be similar to the composition of the Earth's atmosphere at a very early stage, before the beginnings of life.

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