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## Gaia reaches for the stars

19 December 2013

### Space observatory to survey the Milky Way in 3D by 2018

It is the beginning of a new astrometric age – from now until 2018, Gaia, the new European Space Agency (ESA) space observatory, will measure the positions, distances and motion of over one billion stars and, for the first time, create a 3D map of the Milky Way. In addition to its contributions to ESA, Germany is supporting the science operations and data analysis for Gaia with around 15 million euros, which is about 10 percent of the total. The German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) is implementing the German share of the project as part of the national space programme.

On 19 December 2013 at 10:12 CET, Gaia took off on its journey to the stars from the European Spaceport in French Guiana aboard a Russian Soyuz launch vehicle.

"The Gaia telescope offers new level of precision – Europe will thus play a leading worldwide role in astrometry. Following the successful Hipparcos mission, this is the second ESA astrometric observatory; its enhanced measurement accuracy will give us a much clearer picture of the dynamics and evolution of the Milky Way. Gaia can not only study stars, but also other celestial objects above a certain minimum brightness," said DLR Executive Board Chairman Johann-Dietrich Wörner, currently also Chairman of the ESA Council. For example, the spacecraft is expected to study millions of asteroids and comets, and thousands of extrasolar planetary systems; it is also expected to discover brown and white dwarfs, supernovae and quasars, and look for clues regarding the distribution of mysterious dark matter.

### Galactic discovery machine

Dietmar Lilienthal, Gaia Project Manager at the DLR Space Administration, was at the launch of the spacecraft in French Guiana: "Gaia is a discovery machine that will create a galactic census; thanks to the precision of its telescopes, we will get a very precise spatial idea of what surrounds us. Since we are not located near to the middle of the Milky Way, it takes a special effort to obtain a complete overview of our home galaxy," says the astrophysicist.

The space observatory weighs around two tons, is about three metres tall and has two high-precision telescopes and a camera with 106 individual light-sensitive CCD sensors having a total of around one billion pixels. In about one month, Gaia will reach its operational orbit around the second Lagrange point of the Earth-Sun system, 1.5 million kilometres away from Earth in the anti-Sun direction. In each of its two fields of view, the observatory will observe 250 stars per second. Over the course of the mission, this will produce about one petabyte of data, which corresponds to the storage volume of 200,000 DVDs. Besides the composition of the Milky Way, with Gaia, scientists want to explore the interactions with other galaxies like the Magellanic Clouds and Andromeda. The measurement accuracy of star positions for the brightest stars is 10 to 20 micro- arcseconds – up to 100 times better than that the precursor mission, Hipparcos; this angular resolution corresponds to the observed diameter of a Euro coin on the Moon, viewed from Earth. Gaia will continuously conduct measurements for five years.

Four German academic institutions are involved in the mission: the Astronomisches Rechen-Institut at the Centre for Astronomy of Heidelberg University, the Max Planck Institute for Astronomy (MPIA) in Heidelberg, the Leibniz Institute for Astrophysics Potsdam (AIP) and the Lohrmann Observatory, Dresden Technical University. Their task is primarily the provision of special software to process the huge amounts of data from Gaia, which the European Space Operations Centre (ESOC) in Darmstadt plays a leading role in receiving. The scientists have

developed, among other things, mathematical techniques for astronomical data analysis and relativistic correction, and methods for generating the complex software needed for these tasks.

The European aerospace group EADS Astrium constructed the Gaia spacecraft. More than 400 scientists from 24 European countries are involved in the mission.

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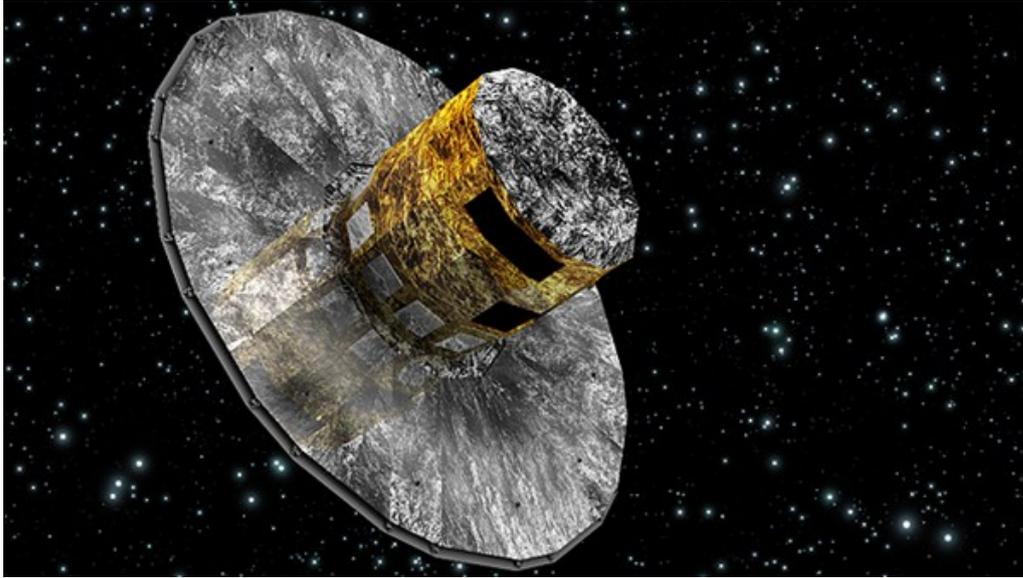
## Launch of the Gaia space observatory on 19 December 2013



On 19 December 2013 at 10:12 CET, Gaia took off on its five-year mission from the European Spaceport in French Guiana aboard a Russian Soyuz launch vehicle. Four German academic institutions are involved in the mission. The DLR Space Administration is coordinating the German share of the project.

Credit: ESA.

### Artist's impression of the Gaia observatory



By 2018, Gaia, the new European Space Agency (ESA) space observatory, will have measured the positions, distances and motion of over one billion stars and, for the first time, created a 3D map of the Milky Way. In addition to its contributions to ESA, Germany is supporting the science operations and data analysis for Gaia with around 15 million euros, which is about 10 percent of the total. The German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) is implementing the German share of the project as part of the national space programme.

Credit: ESA.

### Sister of the Milky Way – the spiral galaxy NGC 6744



The space observatory Gaia will map the Milky Way in three dimensions by 2018. The spiral galaxy NGC 6744 probably looks very similar to our home galaxy. Astronomers of the European Southern Observatory used the Wide Field Imager at the MPG / ESO 2.2-meter telescope at La Silla (Chile) to obtain striking images of NGC 6744 and create this image. The galaxy is located about 30 million light years from Earth in the constellation Pavo (the Peacock), visible in the southern sky.

Credit: ESO.

## Gaia – preparing the spacecraft for launch in French Guiana



Engineers prepare the ESA scientific spacecraft Gaia for launch in clean room S1B at the European spaceport in French Guiana.

Credit: ESA-CNES-Arianespace / Optique Vidéo du CSG - JM Guillon .

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