SRON Netherlands Institute for Space Research is the Dutch expertise center for space research. The institute develops and uses innovative technology for groundbreaking scientific research in space, focusing on astrophysical research, earth science and planetary research. In addition to this, SRON has a line of research into new sensitive sensors for X-rays and infrared radiation that now rank among the most sensitive in the world. SRON is part of the Netherlands Organisation for Scientific Research (NWO).

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SAFARI: hunting for answers in the cool universe

SRON Netherlands Institute for Space Research

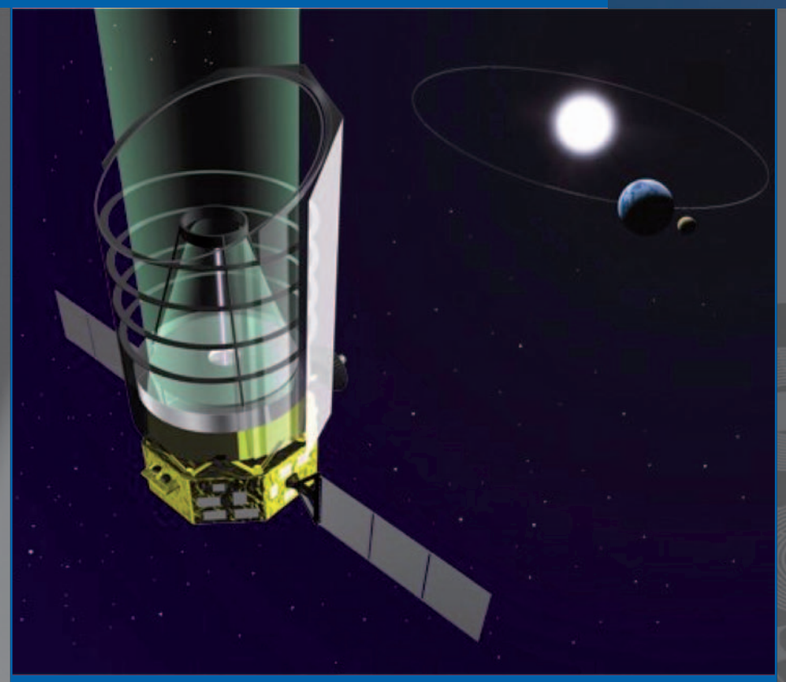
Birth of galaxies and planets

From 2018 onwards, astronomers will be able to use SAFARI, an instrument that combines and exceeds the best qualities of its predecessors. SAFARI is one of the scientific instruments onboard the Japanese space telescope SPICA, which will help to answer fundamental outstanding questions in astronomy. How are galaxies and planetary systems formed? Is our solar system an exception or a frequently occurring constellation? What are the conditions under which life on planets can evolve?

SAFARI will search for ice and water vapor in protoplanetary discs. The physical and chemical conditions in these protoplanetary discs ultimately determine the formation of planets.

Successor to HIFI instrument

SAFARI is the immediate successor to SRON's molecule hunter HIFI onboard the infrared telescope Herschel. The new and unique infrared imaging spectrometer can fully utilize the ultra-sensitive TES detectors in combination with SPICA's extremely cold mirror to look even deeper into the far-infrared universe than HIFI. SAFARI will search for the first galaxies to determine how they were formed and how they evolve. Nearer by the instrument will be used to study the ice and water vapor in protoplanetary discs – the physical and chemical conditions in these protoplanetary discs ultimately determine the formation of planets.



The mirror of SPICA will be cooled to almost absolute zero (-273 °C).

A deeper look into the universe...

No longer blinded by the mirror

The 3.2 meter diameter mirror of the Japanese space telescope SPICA will be cooled to almost absolute zero (-273 °C). Consequently, the detectors will no longer be 'blinded' by the heat radiation emitted by the mirror itself and the instruments will therefore be able to detect even weaker infrared sources than the most sensitive instruments on board ESA's infrared space observatory Herschel can. This will allow us to see sources at the level of the cosmic background radiation in the wavelength range between 30 and 210 µm. After its launch, currently planned in 2018, SPICA will thus be able to look even deeper into the universe than Herschel. The space telescope will carry out its exploration from the so-called Second Lagrange point, which is located about 1.5 million kilometers from earth.

Leading role of SRON

The SAFARI project is complex from both a technological and organizational viewpoint. As Principal Investigator, SRON coordinates the collaboration between the large number of international partners (including JAXA and ESA). In addition to this, SRON is responsible for the further development and testing of the detectors for SAFARI (an SRON/UK joint venture), the optomechanics, the quality control, the construction and the system testing for the entire instrument. TNO is one of the partners in the project; Dutch investments in the technology for SAFARI will amount to about 55 M€.

Rich Dutch tradition

SRON has specialized in infrared space research since the 1970s. For example, SRON constructed the scientific instruments for the space telescopes IRAS (1983) and ISO (1995), which mapped the infrared sky. After that SRON led the development, construction and test phase of HIFI, the Heterodyne Instrument for the Far-Infrared. HIFI is one of three scientific instruments onboard the ESA space telescope Herschel, which was launched in May 2009. The measurements HIFI has made during the first year of Herschel's mission have already led to a rich scientific harvest: more than 50 scientific publications, including some on new forms of water found in space.

Infrared camera with 6000 pixels

SAFARI is the European 'nerve center' of SPICA and is being developed under the leadership of SRON. SAFARI is an infrared camera with about 6000 pixels that can make real 'photos' of the sky in three adjacent wavelength areas. Using a Fourier Transform Spectrometer (FTS) detailed spectral information is obtained, allowing astronomers to determine the chemical composition of the observed celestial sources. TNO is developing the mechanism of this FTS.

Extremely sensitive infrared detectors

SRON's leading role in the development of SAFARI is mainly due to the infrared detectors developed by SRON scientists. Extremely sensitive detectors must be used in SAFARI to gain maximum benefit from the low infrared emissions of SPICA's cooled mirror. In June 2010, an international evaluation committee selected, out of four different technologies, the Transition Edge Sensor (TES) detectors from SRON together with the associated readout electronics.

SRON scientists are working hard on the development of the extremely sensitive TES detectors.