

Cool spacedust survey goes into orbit

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University of Nottingham astronomers will be studying icy cosmic dust millions of light years away — using the biggest space telescope ever built.

Experts in the School of Physics and Astronomy will be using the Herschel Space Observatory, the most powerful telescope ever launched into space, as part of a giant survey to find out more about some of the coldest objects in the Universe.

The Herschel Space Observatory, launched by the European Space Agency this Summer, promises to take our knowledge of the far reaches of space to a new level. It will have the largest mirror of any space telescope — twice the size of the famous Hubble — that will detect the ‘glow’ of spacedust at around -250C, rather than the light from stars.

As well as being able to see star-forming regions very nearby in our own galaxy, it will be able to see galaxies forming when the universe was in its infancy, more than ten billion years ago.

The University of Nottingham is a leading partner in this new survey using Herschel, which is the first space telescope to operate in the sub-millimetre part of the spectrum, between the far-infrared and microwaves. Much of this light — 0.055 to 0.67 mm in wavelength — cannot penetrate the atmosphere and so the only way to study it is from space.

Dr Loretta Dunne, of The University of Nottingham’s School of Physics and Astronomy, is leading the working group on dust in local galaxies. Dr Dunne said: “The survey will be a quantum leap in our understanding of dust in the local Universe.

“Cosmic dust is more than just a nuisance to optical astronomers. It also plays an important role in helping hot gas to cool and collapse to form galaxies and stars, and is the raw building material for planets like our own. The Earth is really a giant ball of cosmic dust! Discovering how dust is created, how long it survives and how much of it is out there, are important pieces of the puzzle of

how the Universe came to look the way it does.”

Dr Steve Maddox, also at The University of Nottingham, is the co-leader of the programme on large-scale structure.

The telescope is named after renowned astronomer Sir William Herschel (1738–1822), who in 1800 demonstrated the existence of infrared light. He also, among many other discoveries, made the first sighting of the planet Uranus.

Herschel is one of the cornerstone missions of the European Space Agency and will have the largest mirror ever built for a space telescope. At 3.5 metres in diameter, the mirror will collect long-wavelength radiation from some of the coldest and most distant objects in the Universe.

Herschel’s size and capabilities mean it will be able to see the ‘stolen’ starlight emitted by cosmic dust in galaxies. Cosmic dust is not like Earthbound dust, but consists instead of tiny particles of carbon and silicates which are made in stars and supernovae and then ‘hang around’ in interstellar space for hundreds of millions of years.

The particles’ very small size — about 800 times smaller than the width of a human hair — makes them exceptionally good at capturing the light from stars, creating the dark patches seen in the Milky Way and other galaxies. The little grains are gently warmed by the starlight they bathe in and the special detectors onboard Herschel will take images of this faint glow, giving us a new view of the cold parts of galaxies.

The survey will be the widest area survey carried out by Herschel and has just been awarded the largest amount of observing time of any open-time project. The observations will take 600 hours spread over the three-year lifetime of the mission.

As it is such a large survey, it has many things to investigate, such as:

- the 'stolen' starlight in over 100,000 galaxies, absorbed by dust and re-radiated at the longer wavelengths only Herschel can see;
- rare gravitational lenses, where the warped space around a foreground galaxy is magnifying a background galaxy;
- 'frustrated' galaxy birth: primeval galaxies with giant black holes which are trying to shut off the birth of the rest of their galaxy;
- how the birth of dust and stars in local galaxies depends on their environment - nature or nurture?

The survey is being conducted by a large international consortium, led jointly by the Universities of Nottingham and Cardiff.

Herschel is due to be launched on an Ariane-5 rocket from the Guiana Space Centre, Kourou, French Guiana, in July 2008. More details on Herschel can be found at:

<http://sci.esa.int/science-e/www/area/index.cfm?fareaid=16>

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