

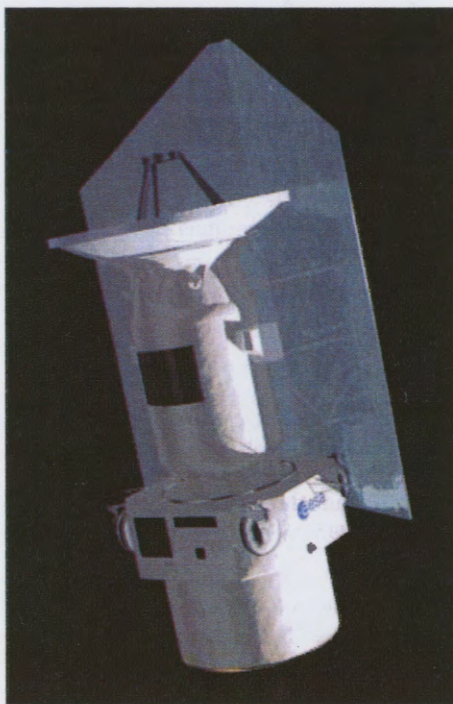
## Far infra-red astronomy with the Herschel Space Telescope

In 2007 the European Space Agency will launch the Herschel Space Observatory into a deep space orbit 1.5 million kilometres from Earth. Herschel will make unique astronomical observations at far infrared wavelengths not possible from the ground because of the absorbing effects of the atmosphere. Because of our expertise in far-infrared optics, we in the Experimental Physics Department at NUI Maynooth are participating in this ambitious project.

Herschel will be particularly suited to observing the tenuous material between stars known as the interstellar medium. This material is gathered under gravity into large tenuous clouds of dust and gas, and Herschel will be able to observe stars like our own sun forming deep within these clouds. Furthermore, by looking at faint distant galaxies in the far infrared we are also looking back in time. It will thus be possible to use Herschel to observe the formation of galaxies in the Early Universe soon after the Big Bang in a period known as the 'Dark Age'. Much closer to home in our own solar system, Herschel will also be used to study comets and planetary atmospheres.

Herschel is a Cassegrain telescope consisting of a 3.5m diameter main reflector with three sophisticated instruments at the focal plane. These instruments, housed

inside an evacuated vessel cooled with liquid helium, will make extremely sensitive and precise measurements of the intensities and spectra in the wavelength range of



Artist's impression of the Herschel Space Telescope in a deep space orbit.

0.08 to 0.70 millimetres. We at Maynooth collaborate closely with the Space Research Organisation of the Netherlands and the Technical University of Delft on one of the instruments known as HIFI, the Heterodyne Instrument for the Far Infrared.

A 'heterodyne' receiver like HIFI works in a similar way to a radio receiver and allows the spectral lines of the interstellar gas and planetary atmospheres to be measured with exquisite precision. A large number of familiar molecules are to be found making up the interstellar gas, not only simple molecules like carbon monoxide but also a large range of organic molecules. The HIFI instrument on Herschel will be able to observe important interstellar molecules like water and carbon dioxide, which it is almost impossible to do from the Earth's surface. With the HIFI instrument, ultra high resolution spectroscopic studies of star forming clouds, young recently born stars and old dying stars will be performed in a wavelength range that is virtually unexplored.

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## Bioinformatics and Pharmacogenomics Laboratory

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The Bioinformatics and Pharmacogenomics Laboratory at NUI Maynooth is involved in a number of research projects both basic and applied. The principle aim is to uncover patterns of nucleotide substitution that have an impact on human health. To this end we are applying computational tools to analyse the huge amount of genomic information that is publicly-available.

Realising that the next generation of researchers will need computational skills in addition to an appropriate training in the molecular sciences, we are also enrolling students for Ireland's first BSc degree course in Bioinformatics.

On another educational front, the Bioinformatics and Pharmacogenomics Laboratory at NUI Maynooth is hosting its 3rd International Bioinformatics Summer School, in 2001, which is funded by EMBO, the European Molecular Biology Organisation.

The Bioinformatics and Pharmacogenomics Laboratory has provided the springboard for the launch of IN4MED Ltd., a company involved in developing human healthcare research by the application of computational tools.

Future work in the lab will involve the analysis of the human genome, human pathogens (bacterial, protist and viral) and probiotics (bacterial) and the development of novel algorithms.

Adaptive Evolution  
Meningitis Genomics  
SNP Analysis  
SuperTree Construction  
Y-Chromosome Analysis  
HIV Genotype Analysis  
Software Development

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