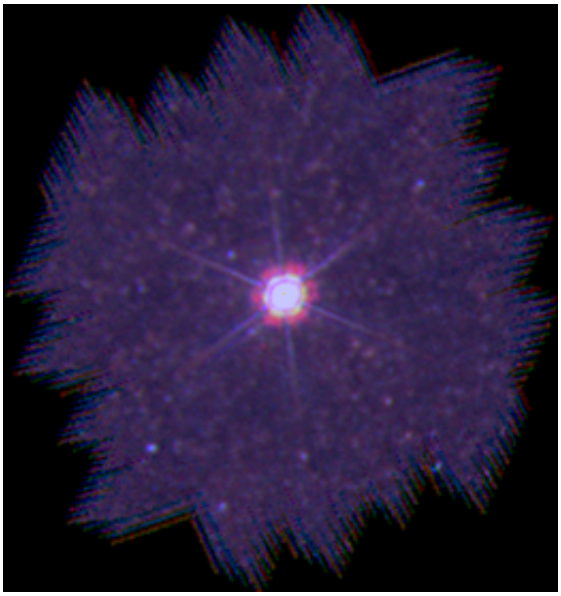
Herschel lives up to the family name

May 16 2011



Herschel image of Uranus, taken with the SPIRE camera, which is seen as a bright point of light. The six-pointed star is due to the construction of the telescope itself, while the red “rosette” in the centre is due to the optics of the Herschel telescope and the camera. The background objects are distant galaxies, all tens of thousands of times fainter than Uranus. Click on the image for more information. Credit: ESA / Herschel / SPIRE

The Herschel Space Observatory has been observing the sky at infrared wavelengths since shortly after its launch two years ago, on 14th May 2009. But the name Herschel has a much longer legacy than that. The observatory is named after Sir William Herschel, a leading astronomer, for discovering infrared light around two hundred years ago. The Herschel family was a particularly astronomical one, with both his sister,

Caroline, and son, John, playing important roles in the history of astronomy.

Born “Friedrich Wilhelm Herschel” in Germany in 1738, William moved to England aged 19, and became one of the leading astronomers of his time. In 1800, he discovered infrared light, which has wavelengths longer than visible light that we see. Herschel was also a very accomplished telescope builder, and spent much of his time systematically observing the sky looking for double stars and nebulae. Working from his home in Bath in 1781, one of William’s most famous discoveries was the planet Uranus. He gained favour from King George III by trying to name it the “Georgian Star”, though the name didn’t stick. The favour did, however, and he was appointed The King’s Astronomer in 1782.

Today, the Herschel Space Observatory is still making use of the planet Uranus. The extensive study of our Sun’s seventh planet means that it is very well understood. Herschel’s SPIRE instrument regularly observes Uranus so that astronomers can calibrate other measurements against the well-known brightness of Uranus.

Professor Bruce Swinyard, from University College London, said “Uranus was one of the first objects we observed with SPIRE, being imaged shortly after the lid over the instruments was opened. One of the reasons Uranus is particularly useful is that its spectrum is very smooth and well understood at our wavelengths, making it an ideal standard to compare other measurements to.”

Uranus is too small for the Herschel satellite to see as more than a very bright point of light. In the background of the image are dozens of faint fuzzy blobs, each one a distant galaxy. This is an excellent illustration of Herschel’s power, as the faint galaxies are typically ten thousand times fainter than the much closer planet Uranus.

Caroline Herschel worked closely with William, and was one of the first female astronomers. She made many discoveries of her own, including a number of comets which bear her name. When she was awarded a £50 annual stipend by King George III, Caroline became the first woman to have an official government appointment. After William's death in 1822, Caroline moved back to Germany and completed his catalogue of nebulae. In recognition of her astronomical work, she was the first woman to be awarded the Gold Medal by the Royal Astronomical Society. The Herschel catalogue of more than 2000 objects formed the basis of the astronomical catalogue which is still used today.

Comets have been important throughout history, and remain so today. They are icy snowballs which were formed at the same time the planets nearly 5 billion years ago. Detailed studies of comets shed light on what the Solar System early in its history, and provide hints as to how the Earth has changed since its formation. While the Herschel Space Observatory isn't observing any of Caroline's cometary discoveries, most of which whizzed past Earth and left the Solar System, it has observed a number of others.

Fittingly, the Herschel satellite observes in a very similar way to the technique used by William and Caroline Herschel themselves – it methodically and systematically scans the sky recording exactly what is seen over large areas of the heavens. It is the ends of these scans which give the jagged appearance to the Herschel images.

The family connection to the work of the Herschel satellite doesn't end with Caroline. William's son, Sir John Herschel, was also an astronomer, and added thousands more objects to the catalogue compiled by William and Caroline. He discovered that many of the bright stars in the sky are located in a band which is tilted relative to the disc of stars that makes up most of our Galaxy. It was an American astronomer, Benjamin Gould, who established that there was a full ring around the sky. Now

known as the Gould Belt, it contains most of the nearby star forming regions, such as the Orion Nebula, and it provides us with a panoramic view of how stars like the Sun are still forming in the Milky Way today.

The far-infrared light measured by the Herschel Space Observatory makes it the ideal instrument for studying star formation, and the Gould Belt is one of its main targets. Using Herschel, Astronomers have mapped star formation in many areas of the Gould Belt, from the Southern Cross to Cygnus, the Swan.

“Those of us working on the Herschel Space Observatory think it's very well named”, said Professor Matt Griffin, from Cardiff University and lead scientist of the SPIRE mission. “It follows in the footsteps of William and Caroline Herschel in surveying the heavens, and it uses the planet that William Herschel discovered as a standard source. Not only that, our cameras on board the satellite actually use a basic technique used by William Herschel himself to measure the infrared light. Two centuries on, I think William and Caroline would be intrigued and certainly quite pleased to see how what they started has developed.”

Provided by Cardiff University