

The UK Infrared Telescope

Infrared Astronomy 200 years on

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Situated at the South end of the East ridge of the summit of Mauna Kea, UKIRT is a telescope designed uniquely for studies of Infrared radiation from astronomical objects as diverse as young stars, brown dwarfs, and active galaxies at the furthest reaches of the observable universe. UKIRT accepts proposals from all nations, and time is allocated after peer review. Two hundred years after the discovery of invisible infrared light, and more than 20 years after its dedication, UKIRT carries infrared astronomy into the 21st Century.



Visit <http://www.jach.hawaii.edu/cgi-bin/irtvid> for a view of the south summit from UKIRT's web camera
Visit <http://www.jach.hawaii.edu/JACpublic/UKIRT/public/gallery.html> to see our gallery of infrared images

William Herschel Discovers the Infrared

William Herschel is most famous for his discovery of the planet Uranus in 1781, the first new planet found since antiquity. But in 1800, Herschel made a discovery which made a much more long-lasting impact on both astronomy and physics. He observed that filters of different colours seemed to pass different levels of heat from the Sunlight falling on them. He went on to split sunlight into a spectrum using a prism, and found - imagine this - that beyond the red end of the spectrum, where no light could be seen by the eye, the heating effect was greater than at any point within the visible region. With this observational tour de force, 200 years ago, infrared astronomy was born.



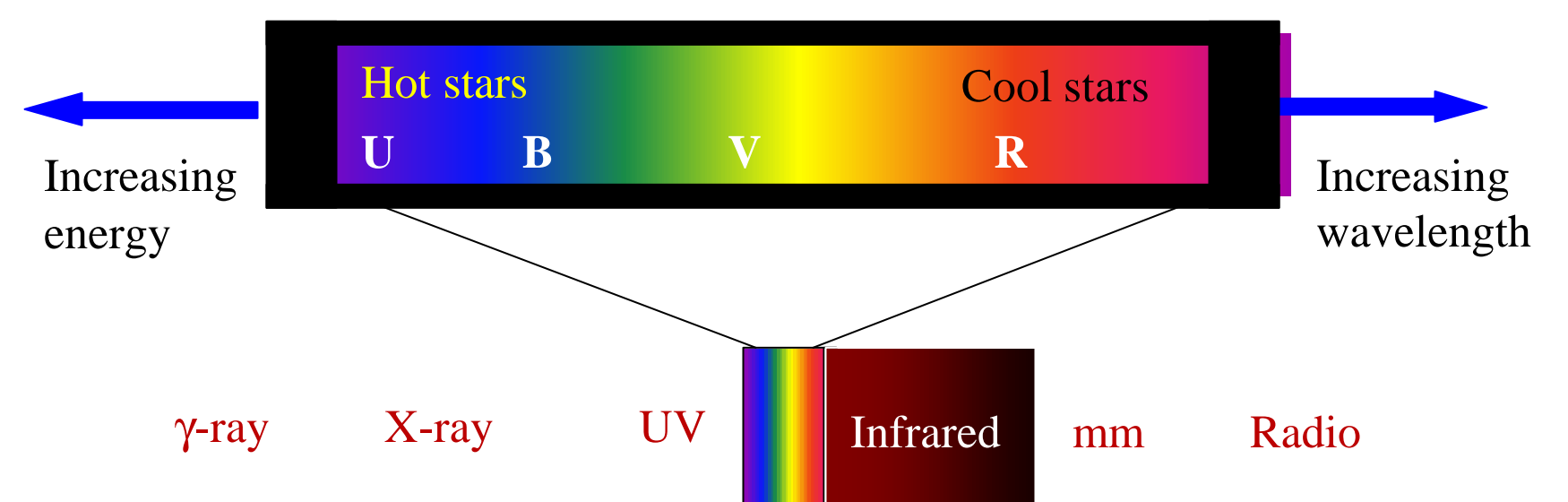
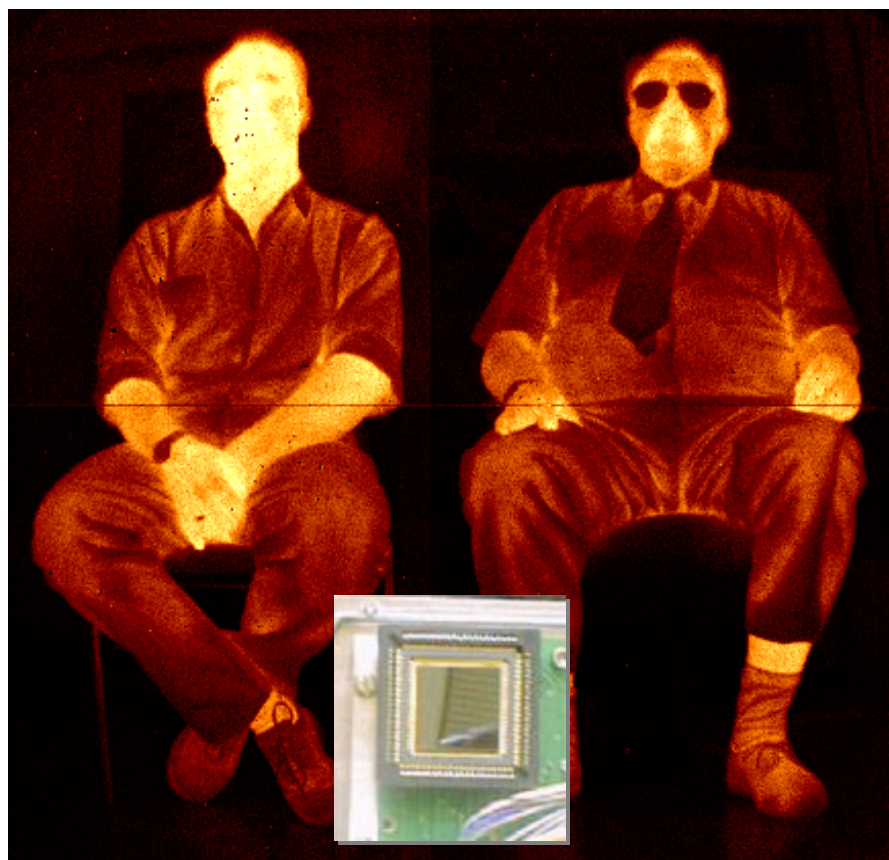
Visible light stops at red...

...but the greatest heating is seen outside the visible spectrum - in the infrared !

We now know that visible light is just the tip of an electromagnetic iceberg which stretches from the lowest-frequency radio waves through to the most energetic X and gamma rays !

Infrared is "cool"

Astrophysicists from the University of Oxford proving conclusively that they are Cool, in an image taken with an infrared-sensitive detector (inset).



Just as red-hot material is cooler than white-hot material, cool stars appear red (there's a good example of this in Orion). Cooler objects still shine most brightly in the infrared.

A Clear View

Our galaxy, one of trillions in the observable Universe, itself contains billions of stars. Most of these are concentrated in the centre of the spiral, in a region which would outshine the full moon if it were not for the presence of vast amounts of absorbing interstellar dust between ourselves and the centre (24000 light years distant). Infrared light is much less absorbed than visible light, enabling us to see clear through to the centre of the Galaxy.

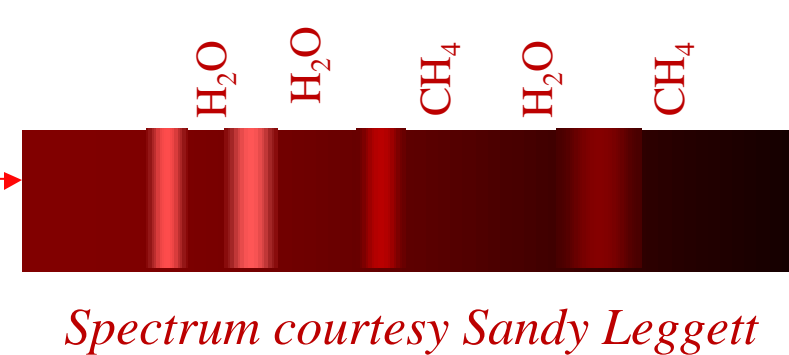
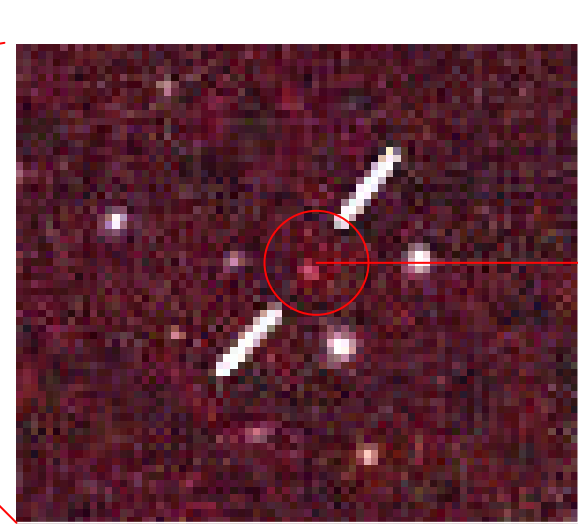
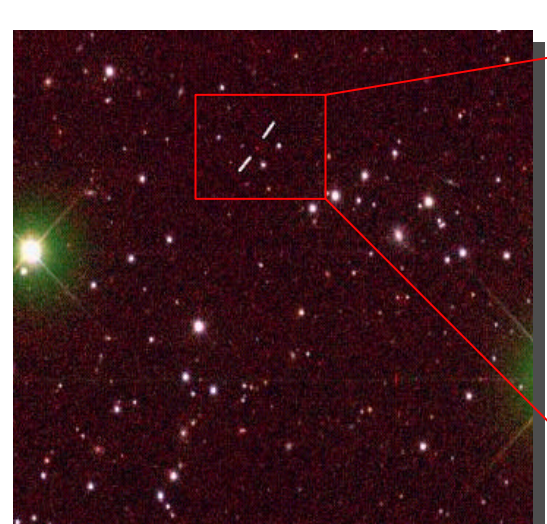


An artist's impression of our spiral galaxy. The Sun and solar system are located well out near the edge of this huge stellar system.

The centre of our galaxy, imaged by UKIRT in infrared light; and seen (or rather not seen!) in blue light in the inset.



Images courtesy Antonio Chrysostomou and Chris Davis



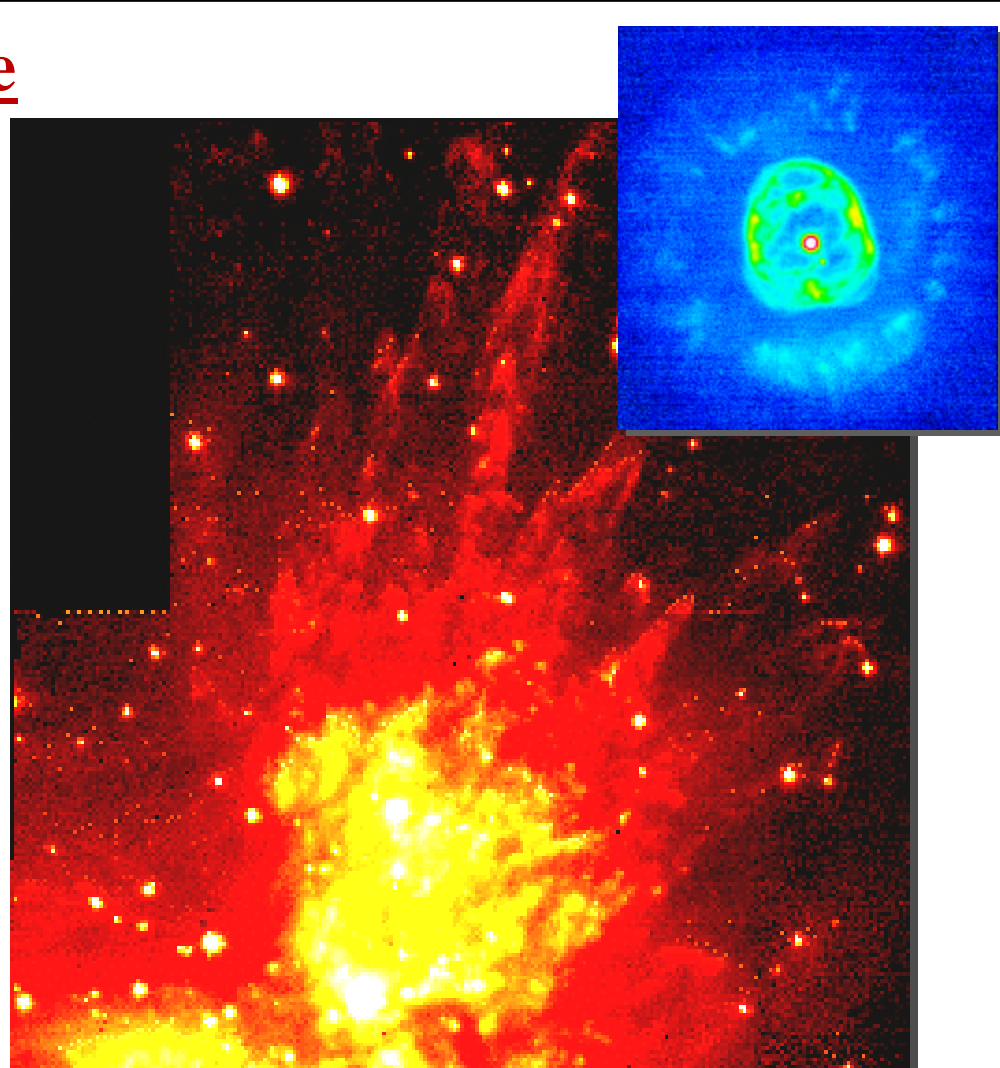
Spectrum courtesy Sandy Leggett

The faintest "stars"

UKIRT infrared spectroscopy has been central to determining the properties of the "atmospheres" of brown dwarfs; the example shown has dark absorption bands indicating an abundance of water and methane molecules. These studies have a direct line of descent to Herschel's original spectroscopy of the Sun!

Being Selective

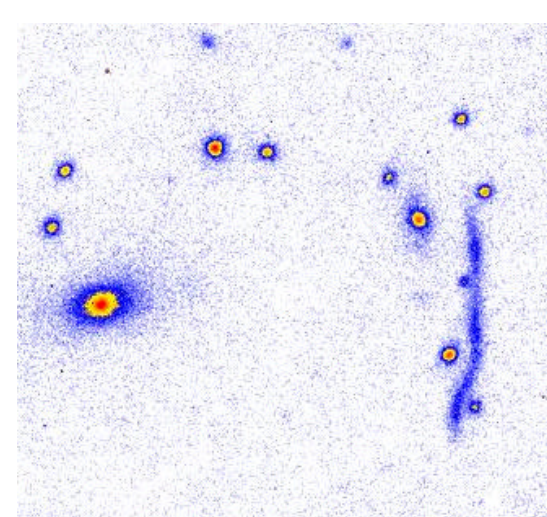
Infrared light from specific atoms and molecules can be singled out, as in the spectacular case of hydrogen molecule emission from within the Orion nebula, or the hydrogen atomic light from the "Eskimo Nebula" (top right).



Images courtesy Antonio Chrysostomou and Chris Davis

Working together

UKIRT infrared and Keck visible-light data combine to image clusters of galaxies at enormous distances (right). Infrared images are also key to detecting bizarre structures such as the amazing gravitationally-lensed filament shown below.



Images courtesy Ian Smail and Alistair Edge, Durham