The Milky Way in Very High Energy Gamma-Ray Light

H E S S

THE UNIVERSITY of ADELAIDE

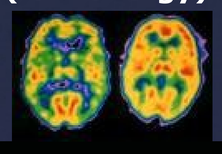
School of Chemistry & Physics
High Energy Astrophysics

Gamma-Ray Light: What is it?

The optical light that we see with our eyes is only a tiny fraction of the total amount of light that exists in the Universe. Other forms of light from the "Electromagnetic Spectrum" are well known to us such as radio, microwaves, infrared, ultraviolet, X-rays and gamma-rays. Some examples of this light in everyday use are shown in the pictures to the right. Gamma-rays are the most energetic form of light and low energy gamma-rays are often used in medical imaging techniques.

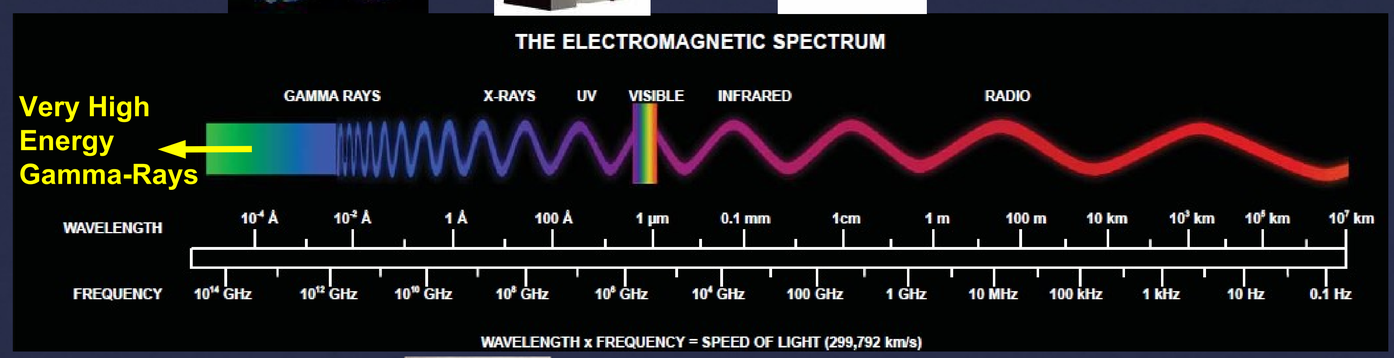
However, even higher energy gamma-rays exist and are produced in outer space. Research astronomers at the University of Adelaide from the High Energy Astrophysics Group are studying these "Very High Energy Gamma-Rays".

Gamma-rays (low energy)



Ultraviolet (UV)

Microwaves



X-rays

Optical

Infrared (IR)

Radio

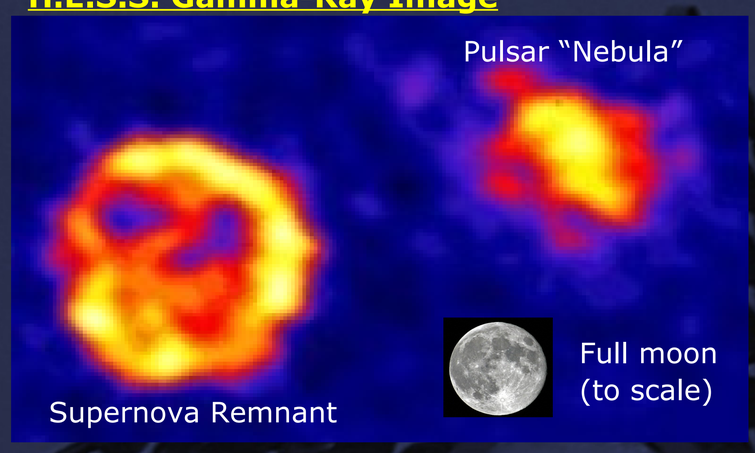
Why is Gamma-Ray Light so useful in Astronomy?

Because gamma-rays are so energetic they are an important way to understand objects in outer space with extreme energies.

A typical object that can produce such gamma-rays are known as "Supernova Remnants", produced when a massive star ends its life in a cataclysmic explosion known as a supernova. Another type of object is a pulsar or extremely dense star core leftover after a supernova explosion.

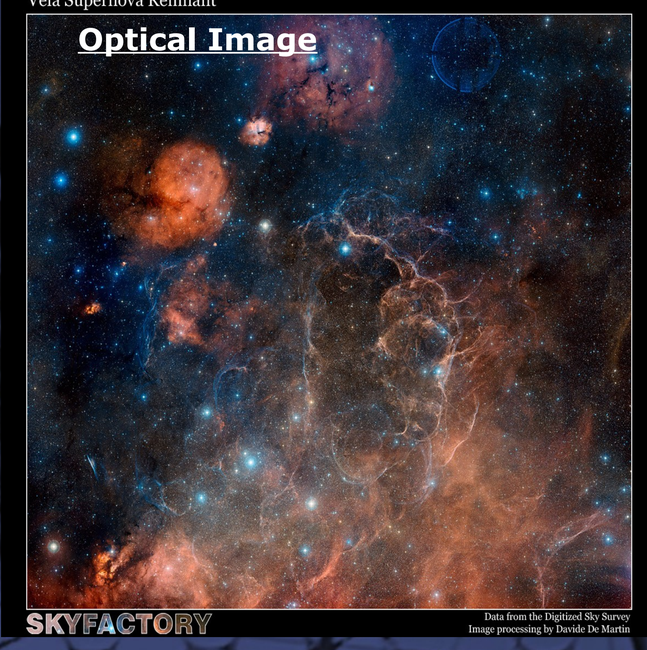
To the right is an example of a supernova remnant and pulsar "nebula" which are very bright in very high energy gamma-ray light. Note the size of the full moon to scale – these gamma-ray objects are very large! The optical image is shown for comparison.

H.E.S.S. Gamma-Ray Image



Vela Supernova Remnant

Optical Image



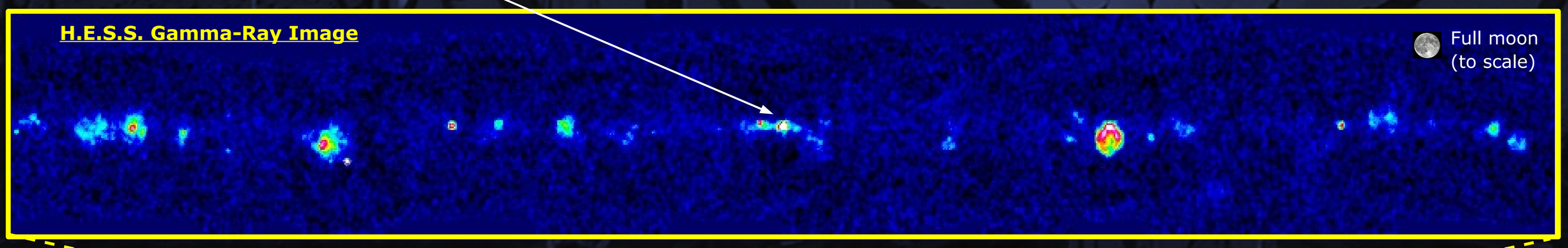
Detecting Very High Energy Gamma-Rays with the H.E.S.S. Gamma-Ray Telescopes

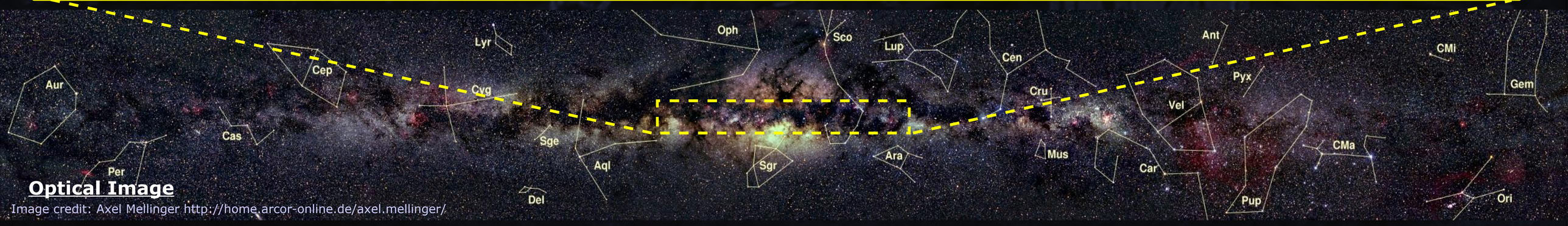
We can detect very high energy gamma-rays using large telescopes on the ground. The H.E.S.S. (High Energy Stereoscopic System) telescopes are 4 x 12 metre diameter telescopes + 1 x 28 metre telescope designed for this purpose. H.E.S.S. is situated in Namibia which offers very dark and cloud-free Southern Hemisphere skies.

The Milky Way in Very High Energy Gamma-Ray Light

The H.E.S.S. Telescopes have imaged parts of the Milky Way in very high energy gamma-ray light, discovering many objects along the way - See the image below (with colour coding white as most intense and black as least intense gamma-ray light). Many of these gamma-ray objects are supernova remnants and pulsar nebulae as well as the centre of our galaxy. The gamma-ray image looks quite different from the more familiar optical view of the Milky Way below.

H.E.S.S. Gamma-Ray Image





Optical Image

Image credit: Axel Mellinger http://home.arcor-online.de/axel.mellinger/

For more information

Adelaide High Energy Astrophysics Group www.physics.adelaide.edu.au/astrophysics/

H.E.S.S. Project www/mpi-hd.mpg.de/hfm/HESS

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