

Exercise #3

Be able to Identify , know the location, and be knowledgeable about the following Distance Space Objects (or be real good at faking it):

Image #	Deep Space Objects (DSO's)	Type/Describe	Within Constellation	Distance from Earth in ly
1	Mira			
2	SNR 0509-67.5			
3	CH Cyg			
4	Kepler's SNR			
5	Tycho's SNR			
6	M 15			
7	Carina Nebula			
8	T Tauri			
9	Sirius B			
10	RR Lyrae			
11	U Scorpii			
12	Rosette Nebula			
13	BP Psc			
14	NGC 2440			
15	RX J0806.3+1527			
16	DEM L 238			
	and DEM L249			

What story can you tell, using these DSO's to explain stellar evolution?

What do these DSO's offer for the study of Type 1 a Supernovas?

Exercise #4 - Take a DSO and Work with it 'til it takes you somewhere.

NGC 2440

Discovered (Mar 4, 1790) by **William Herschel***

A 9th-magnitude **planetary nebula** in Puppis (RA 07 41 55.4, Dec -18 12 29)

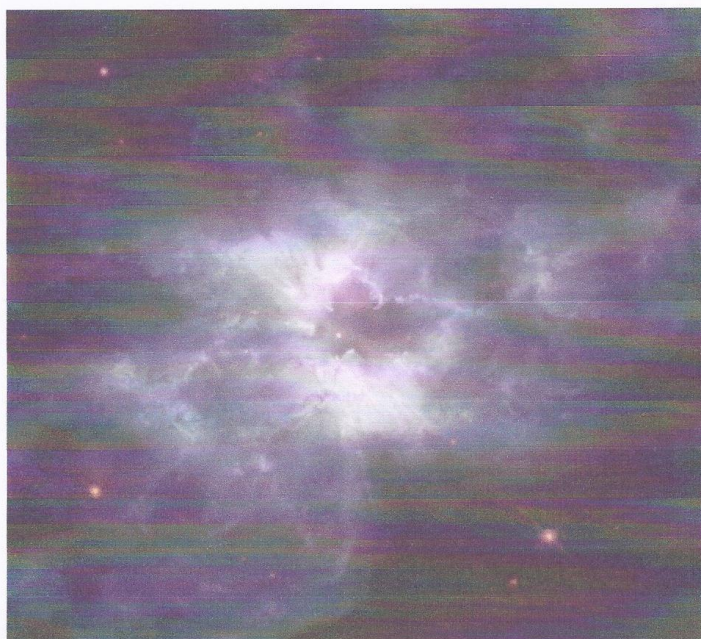
Per Dreyer, NGC 2440 (= John Herschel's GC 1567, 1860 RA 07 35 40, NPD 107 53.0) is "planetary nebula, considerably bright, not very well defined". The position precesses to RA 07 41 54.8, NPD -18 12 33, within 0.2 arcmin of the center of the nebula, so the identification is certain.

NGC 2440 lies about 4000 light-years from the Sun, and given its size (about 74 by 42 arc-seconds), is nearly 100 thousand AUs (approximately 1 1/2 light years) across its longest dimension, with a central star of 14th magnitude.

The planetary nebula must be relatively young, as its white dwarf is one of the hottest known (more than 200 thousand Kelvins, or about 400 thousand Fahrenheit), and despite its small size (about 1/40 the size of the Sun, or 2 to 3 Earth diameters), is about 250 times brighter than our Sun. The complex structure of the nebula (shown in more detail in the second image), indicates several episodes of mass ejection, in different directions. Both HST images are "false-color" images, meant to bring out detail which would not be visible in the essentially monochrome view which the human eye would perceive (even if close to the nebula), but the first is meant to approximate "natural" colors, while the second makes no effort to do so.

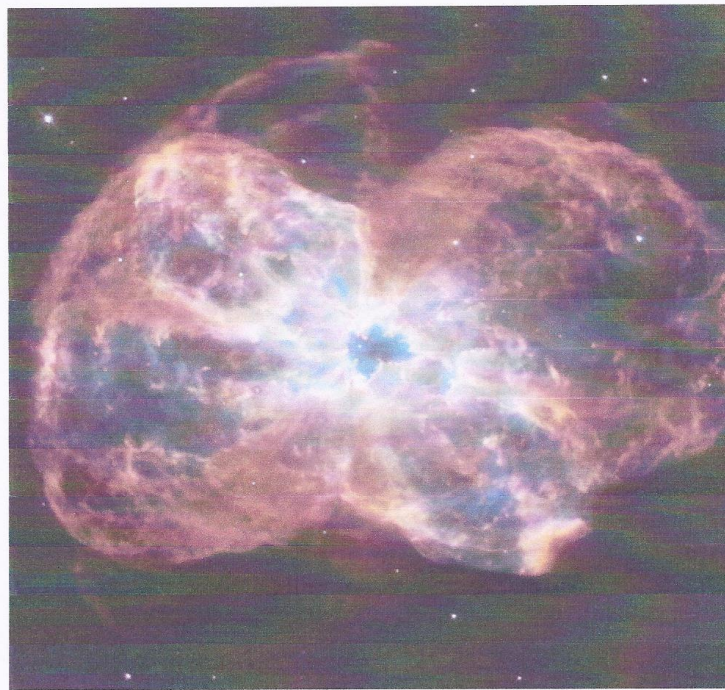
*Historical Note: **Sir Frederick William Herschel**, (15 November 1738 – 25 August 1822) was a German-born British astronomer, technical expert, and composer. Born in Hanover, Wilhelm first followed his father into the Military Band of Hanover, but emigrated to Britain at age 19. Herschel became most famous for the discovery of Uranus in addition to two of its major moons, Titania and Oberon. He also discovered two moons of Saturn and infrared radiation. Finally, Herschel is less known for the twenty-four symphonies that he composed.

A simulated natural color image of the core of the planetary nebula **NGC 2440**
(Image Credits: H. Bond (STScI), R. Ciardullo (PSU), WFPC2, HST, (processing by Forrest Hamilton), NASA)



Below, a false-color image of the entire nebula **NGC 2440**

(Image Credits: (NASA, ESA, K. Noll (STScI) Acknowledgment: Hubble Heritage Team (STScI / AURA), HubbleSite.



Below, a 12 arcmin wide region centered on the planetary nebula **NCR 2440**
(Image Credits: Partial superposition of Jeff Cremer/Adam Block/NOAO/AURA/NSF/AOP
image on DSS image.

