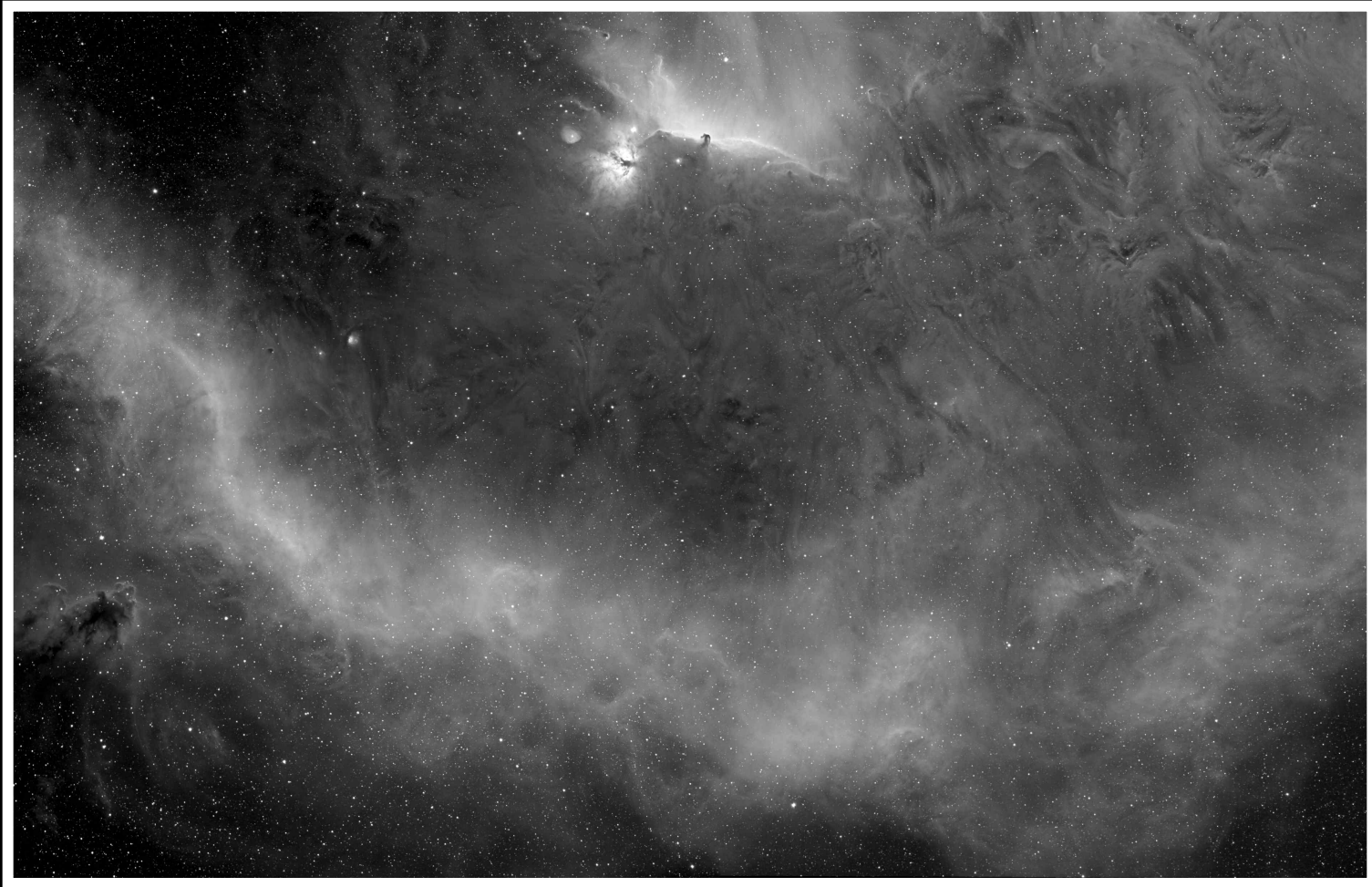


The ISM: stuff between the stars

(Faint Gas around the Horsehead Nebula)



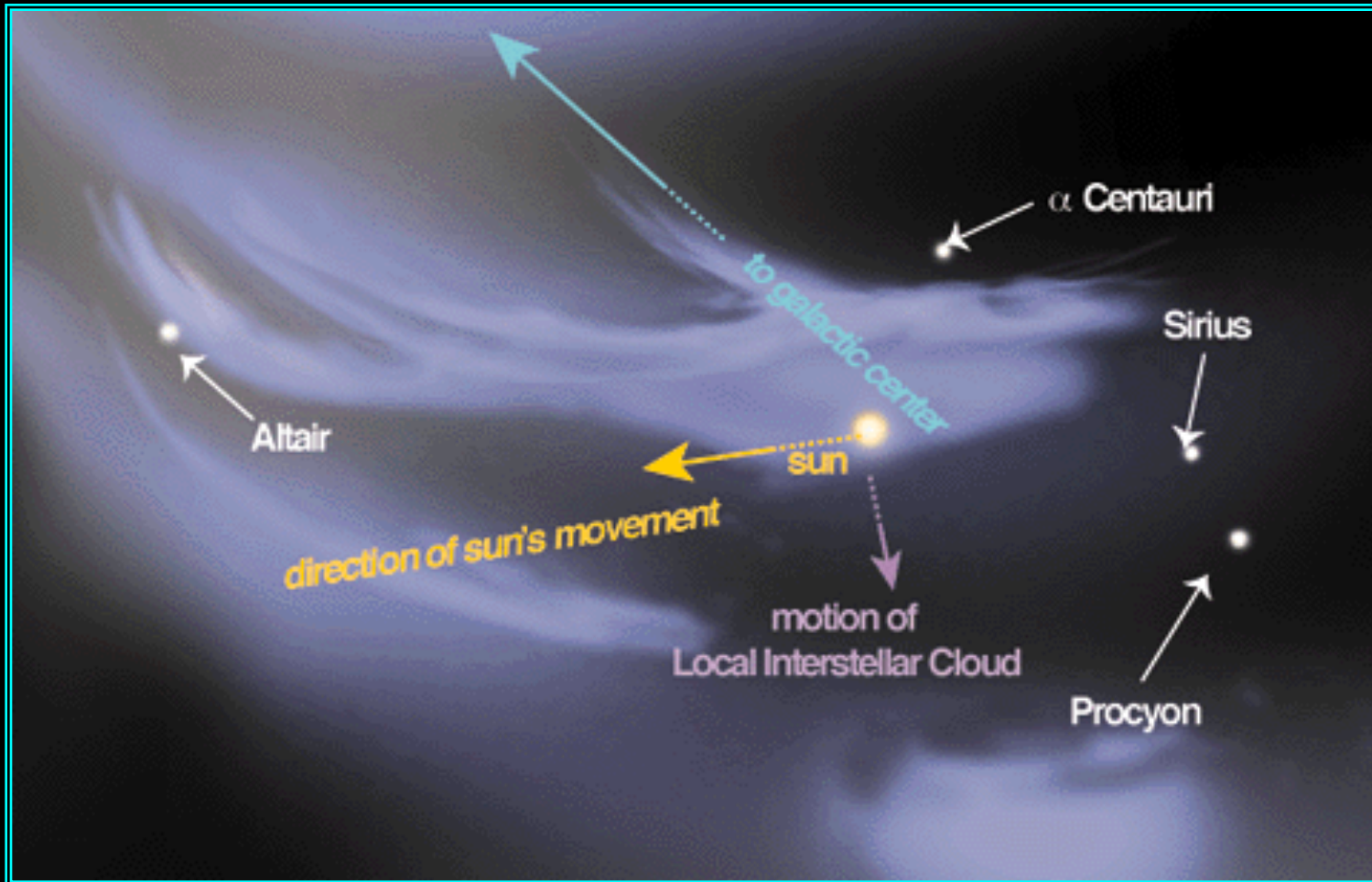
Interstellar Medium

Many “inter-media” :

- i. Interplanetary – space between planets
- ii. Interstellar – space between stars
- iii. Intergalactic – space between galaxies

This “space” is NOT a vacuum, although in some cases it isn't far!

Solar Motion thru the ISM

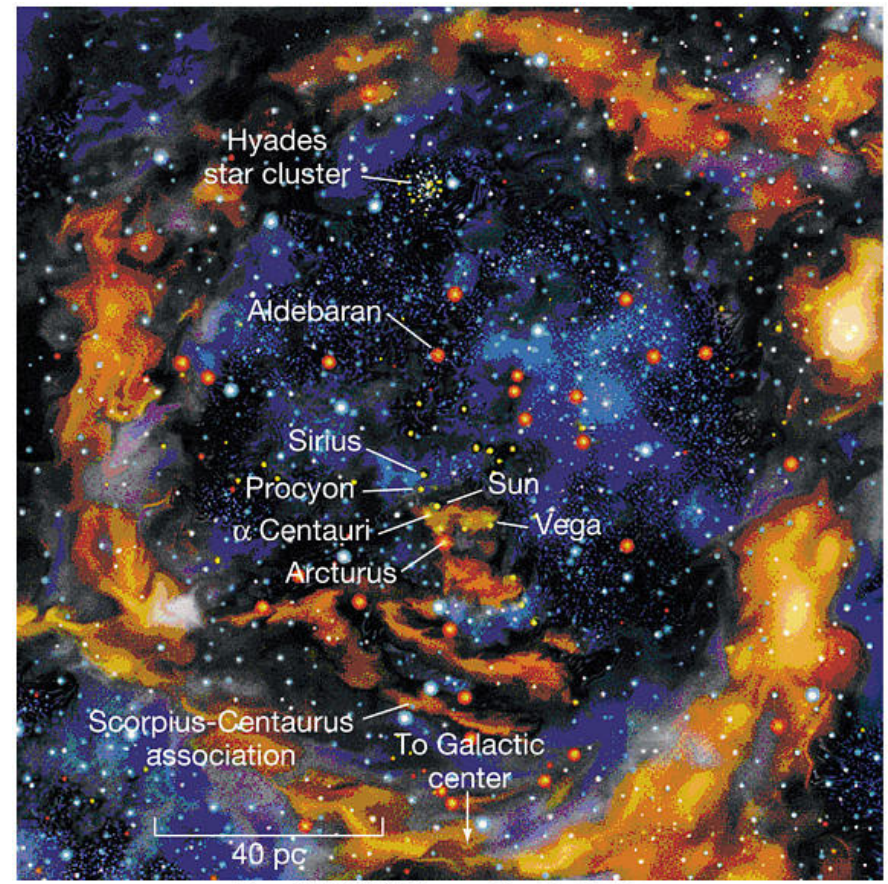
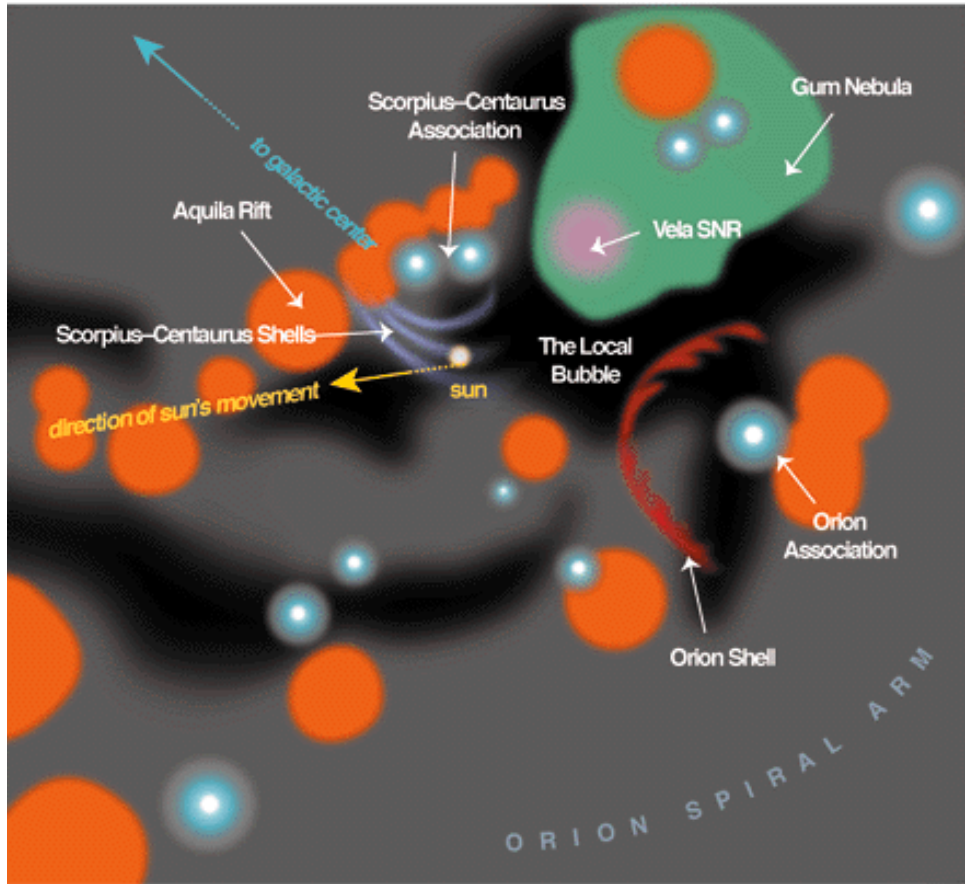


ISM Components

- ISM is very inhomogeneous, with multiple components

	<u>T(K)</u>	<u>n(cm⁻³)</u>	<u>Fill Factor</u>
<i>Clouds:</i>			
H ₂	15	200	0.1%
HII	8000	15	0.1%
HI	120	25	2%
<i>Intercloud:</i>			
Warm HI	8000	0.3	40%
Warm HII	8000	0.15	20%
Hot HII	10 ⁶	2x10 ⁻³	40%

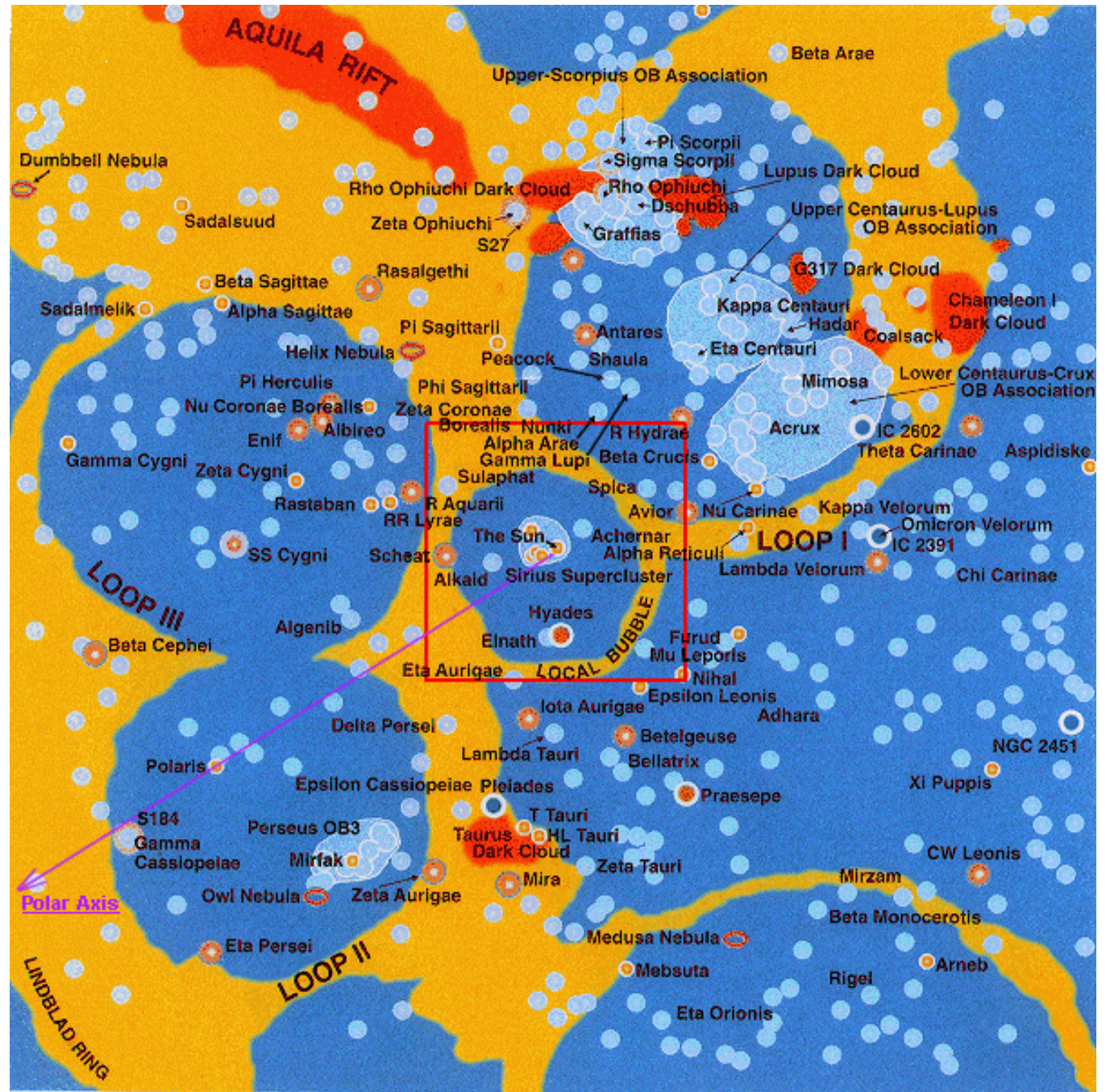
Our Local Interstellar Medium



■ molecular clouds ■ diffuse gas

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Panning
Out a
Bit ...



Nebulae

Clouds of gas and/or dust

- *Emission Neb.* - reddish
 1. HII regions
 2. Planetary Nebulae (PNe)
 3. SN Remnants
- *Reflection Neb.* - bluish
- *Dark Neb.* - blocks light from more distant stars

Reflection and Emission Nebulae



Another Example of Colors



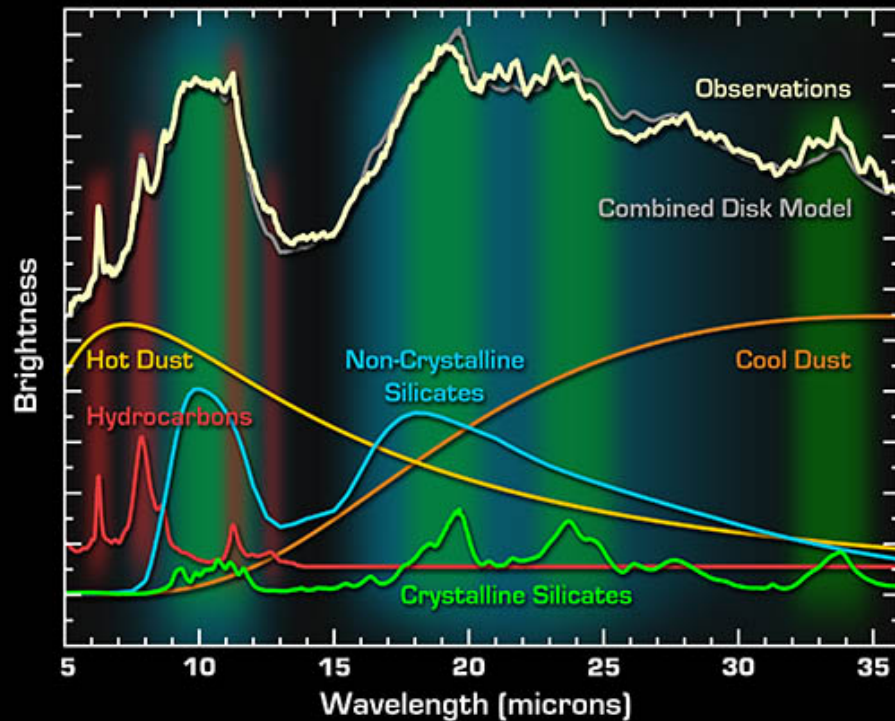
Absence of stars here implies what?

Dark Nebula

Saw this same
image in relation
to extinction issues

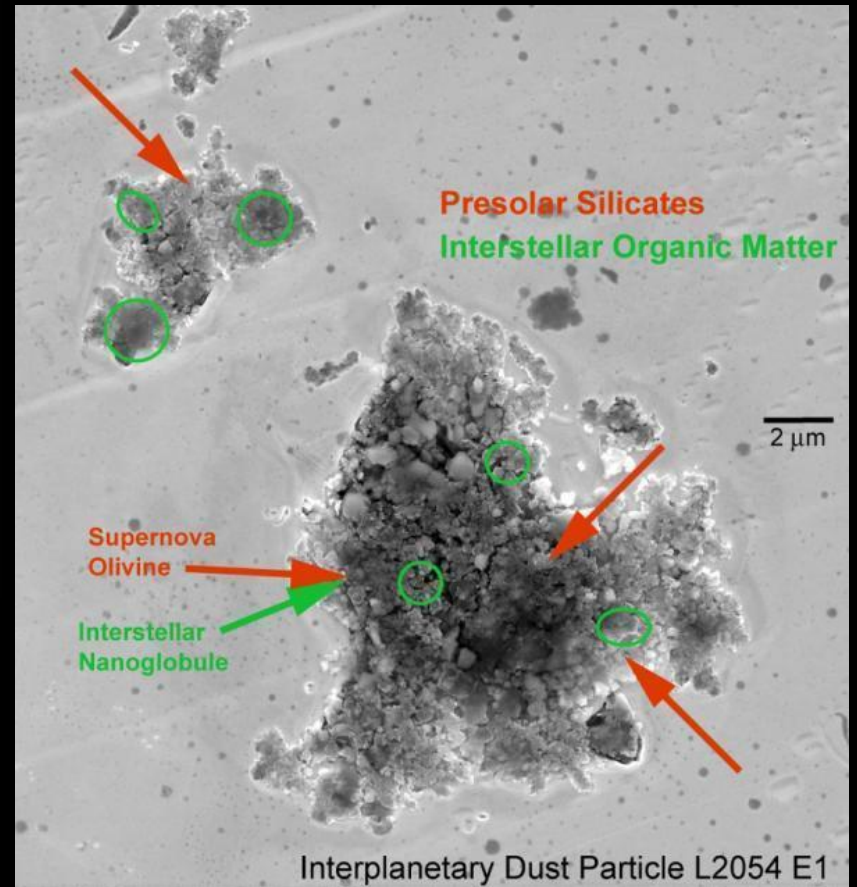


DUST: Turns out that dust plays an important role in astronomy. It has strong extinction properties, represents complex chemistry, and is a source of infrared radiation. Here is an example of different dust types, in this case in the disk of a B supergiant star.



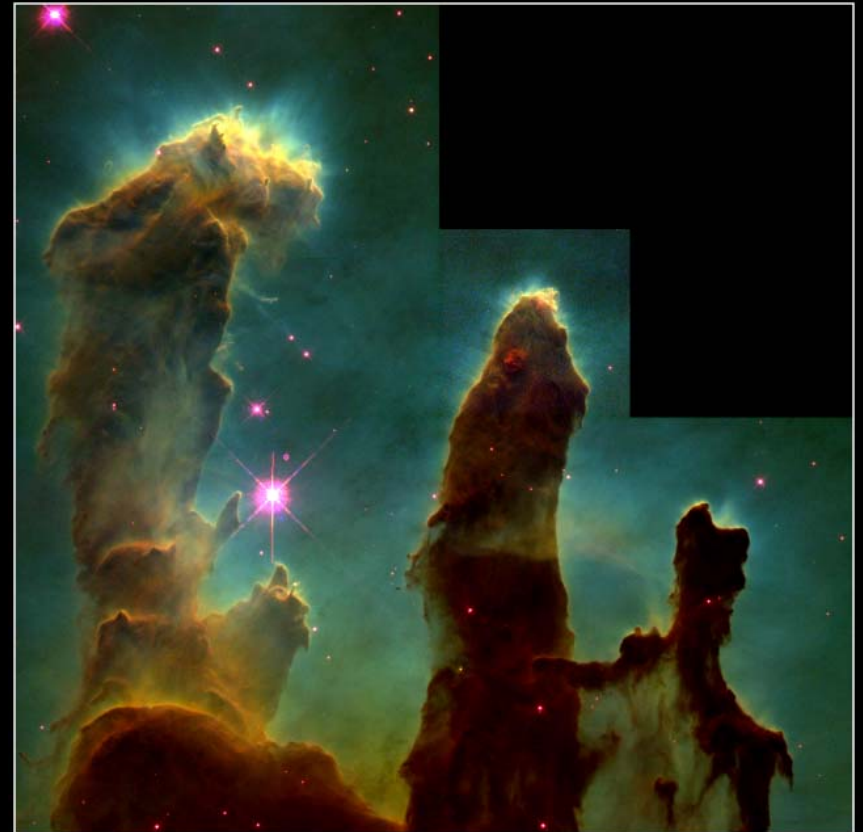
Dust Disk around Hypergiant Star R 66
NASA / JPL-Caltech / B. Sargent (University of Rochester)

Spitzer Space Telescope • IRS
ssc2006-05a



Interplanetary Dust Particle L2054 E1

Cold Gaseous Columns



Gaseous Pillars · M16

HST · WFPC2

PRC95-44a · ST ScI OPO · November 2, 1995
J. Hester and P. Scowen (AZ State Univ.), NASA

Star Formation “Nests”

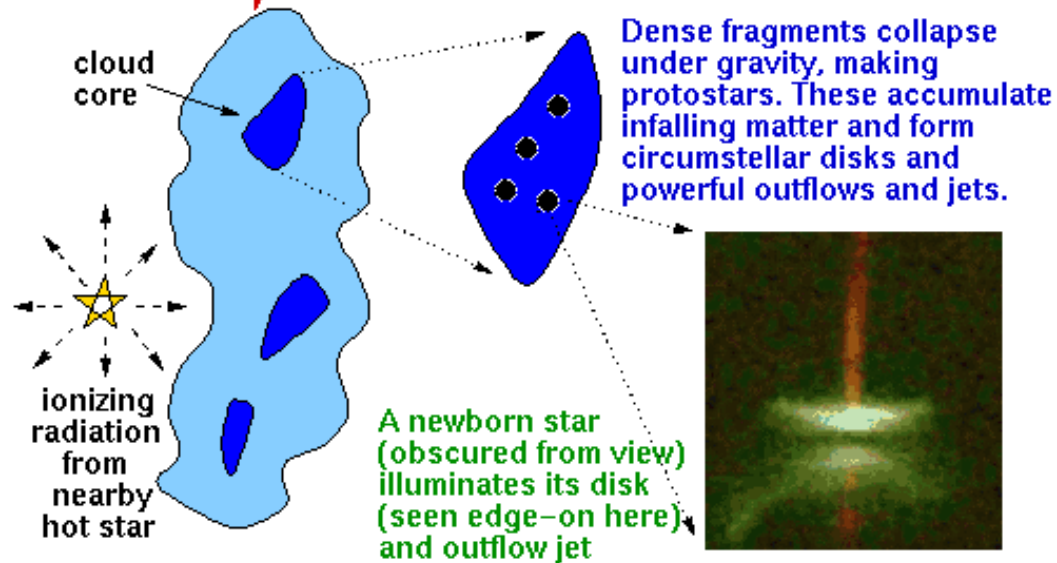


Molecular clouds are cold, dark, giant condensations of dust and molecular gas which serve as “stellar nurseries”.

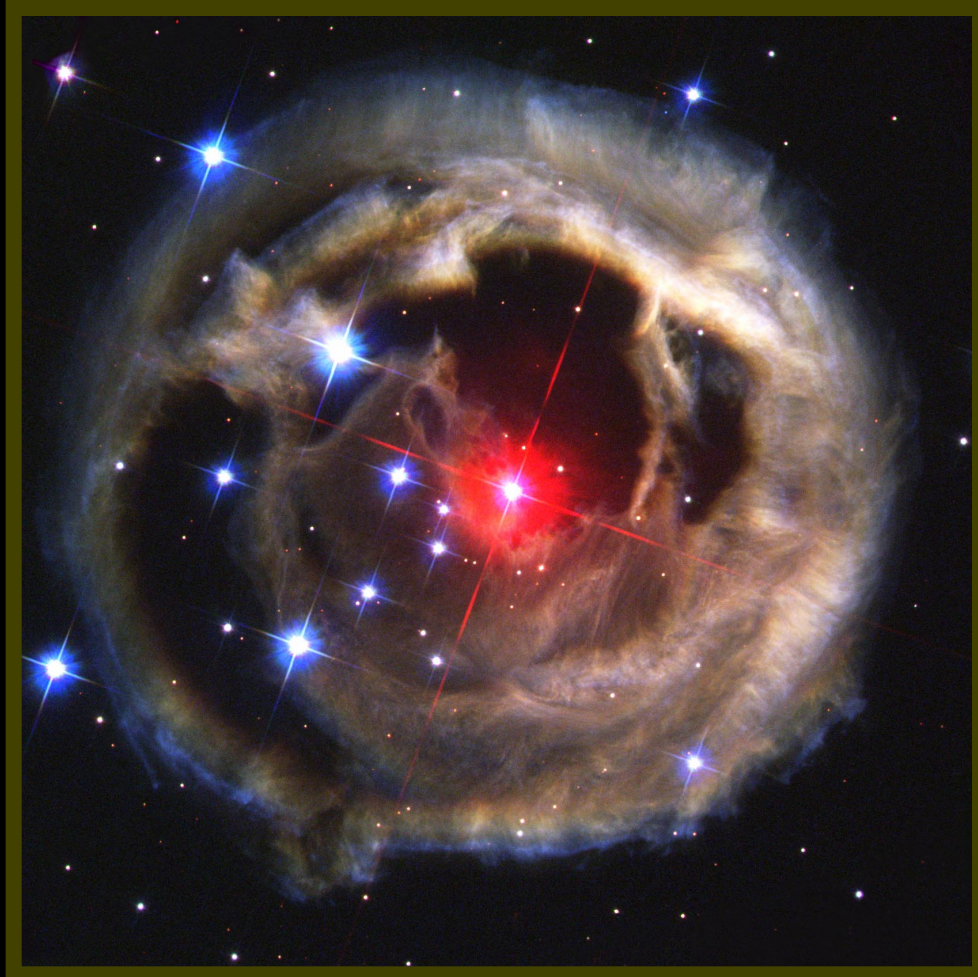
All stars are born in molecular clouds, including our Sun. Molecular clouds are the “stuff” we’re made of!

Because of their dusty content, visible light cannot penetrate into a molecular cloud. Thus, infrared and submillimeter observations are needed to “see” the star-forming process.

molecular cloud



Stellar Recycling - Wind Ejecta

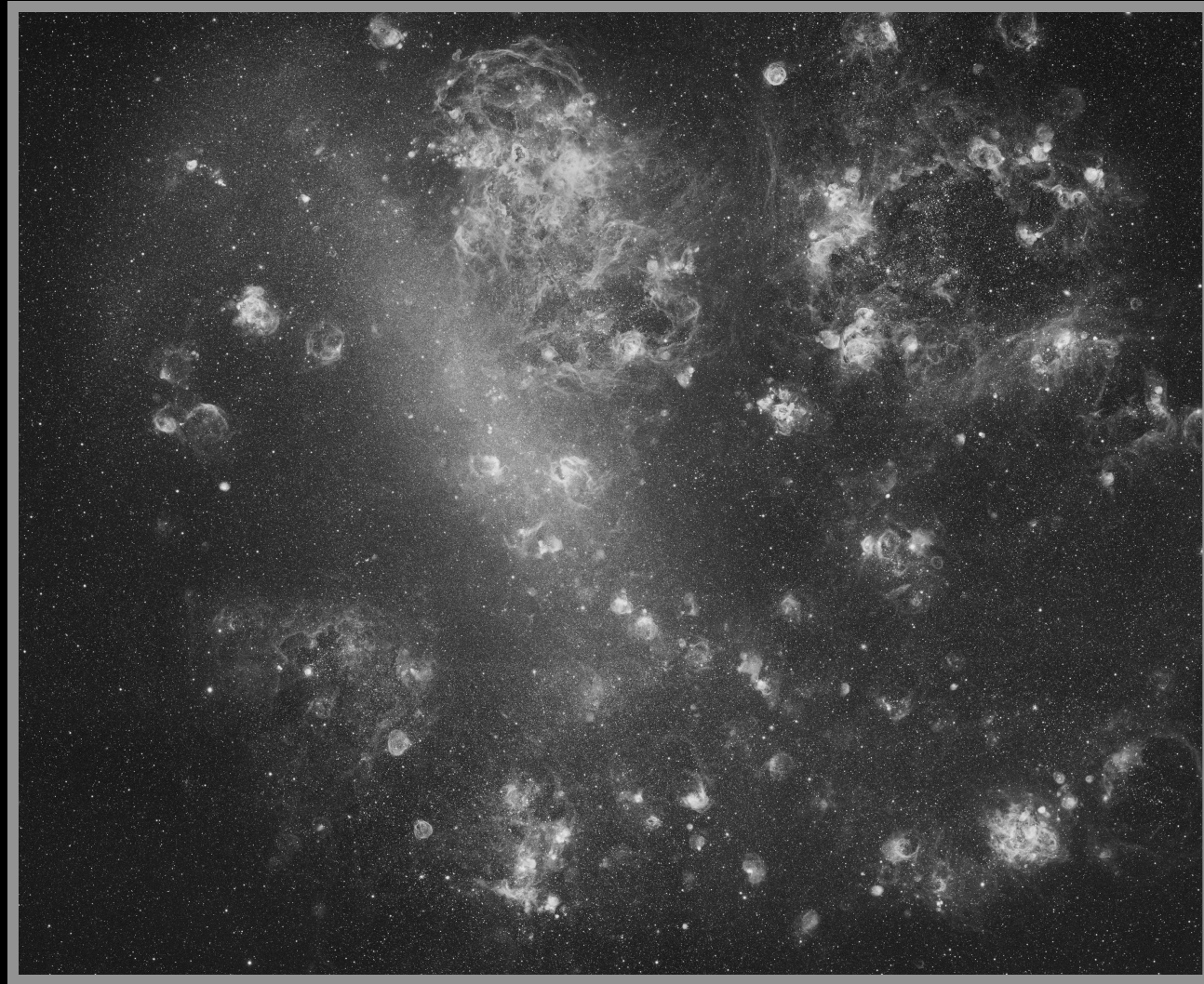


Another Example: Mira

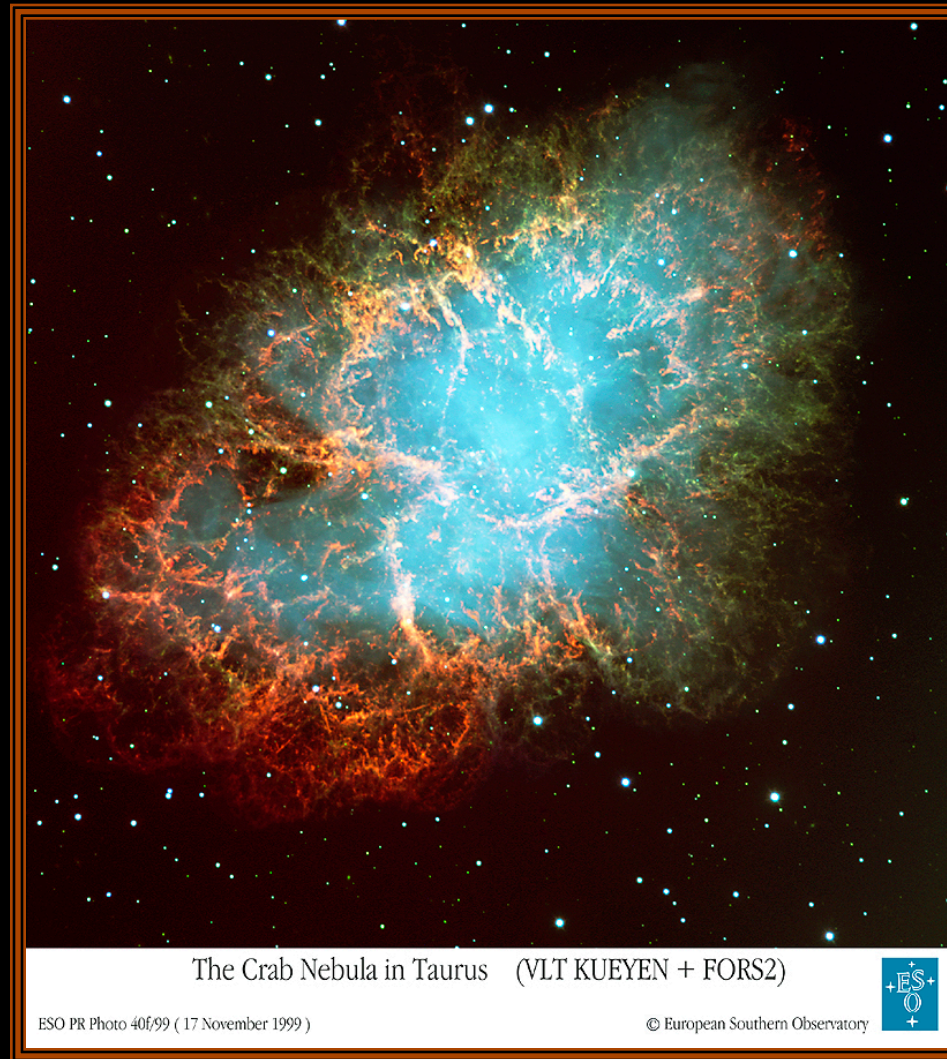
(seen by GALEX)



Wind-Blown Bubbles in the LMC



Crab Nebula - A Supernova Remnant



Vela Supernova Remnant



SKYFACTORY

Data from the Digitized Sky Survey
Image processing by Davide De Martin

HII Region - The Rosette Nebula



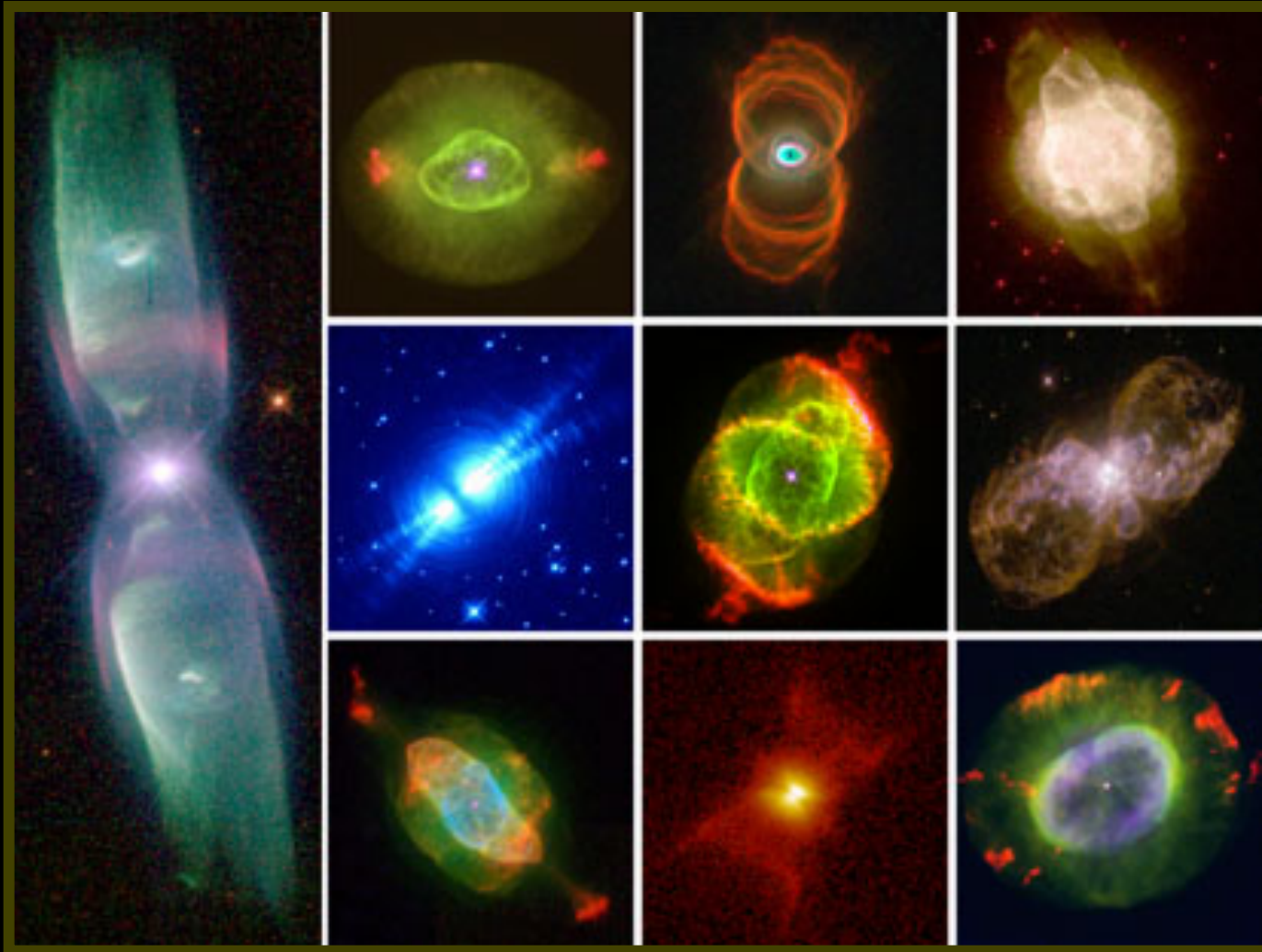
Planetary Nebula



Planetary Nebulae are Solar Endpoints



More Planetary Nebulae (HST)



A Pretty One: *The Boomerang*



**Example
of Faint
Extended
Structure**

