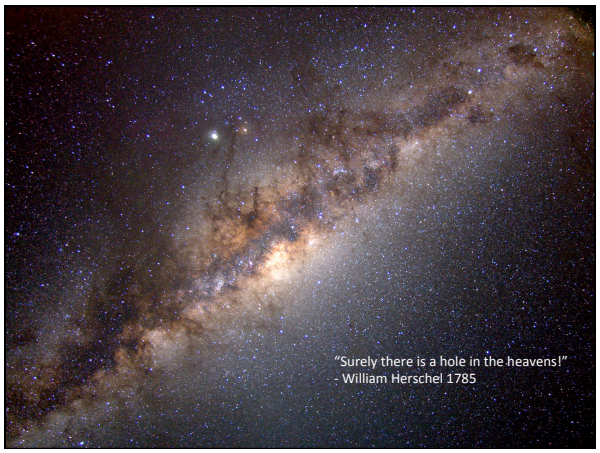
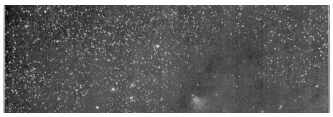


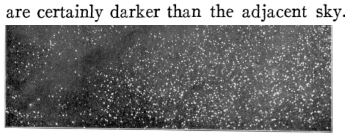
ON A NEBULOUS GROUNDWORK IN THE CONSTELLATION *TAURUS*

By E. E. BARNARD



W

I have been slow in accepting the idea of an obscuring body to account for these vacancies; yet this particular case almost forces the idea upon one as a fact. There are portions of this apparent vacancy that are certainly darker than the adjacent sky.

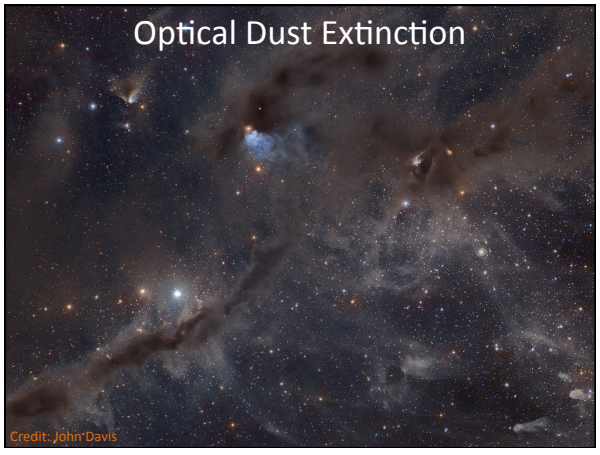


Vacancy and Nebula in *Taurus*

10-inch Lens. 1907, January 9, 12h 27m to 17h 55m G. M. T. Enlarged 1.6 times. Scale: 1° = 35 mm.

Barnard 1907

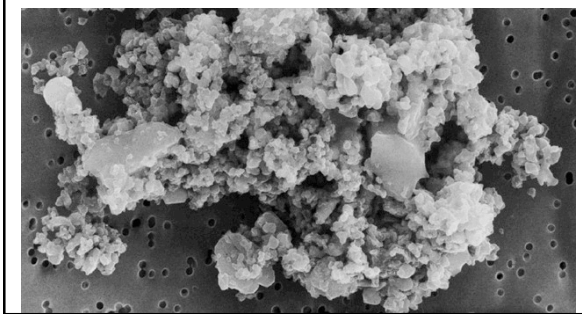
Optical Dust Extinction



Credit: John Davis

Interstellar Dust Grains

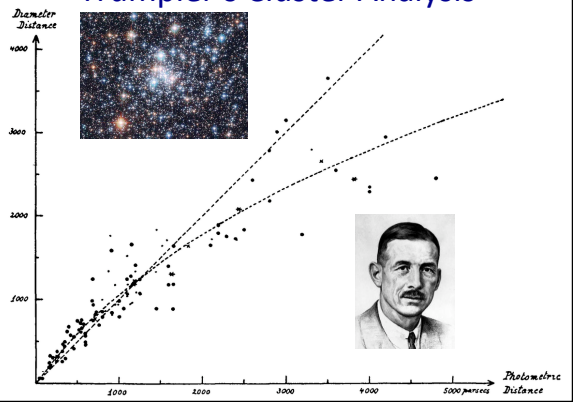
ISM dust sizes from a few atoms up to few μm sizes
can grow much larger in protoplanetary disks
Primarily made of silicates (SiO), carbanceous (C), and ferrous (Fe) materials etc.



Recognizing Dust - History

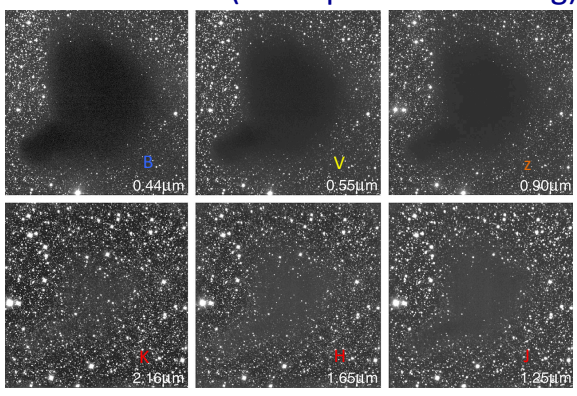
- As early as 1867 Wilhelm Struve found that the density of stars diminished with increasing distance from the Sun: "Stars are dimmed!"
- Robert Trumpler 1930 compared luminosity and size of open clusters assuming all their diameters were the same. Identified absorption with increasing distance.
- Rudnick 1936, Hall 1937, and Stebbins et al. 1939 derive the interstellar reddening law ~ λ^{-1}

Trumpler's Cluster Analysis



Why is this cloud blue ?

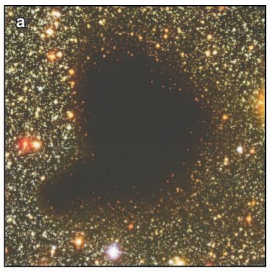
Dust Extinction (Absorption+Scattering)

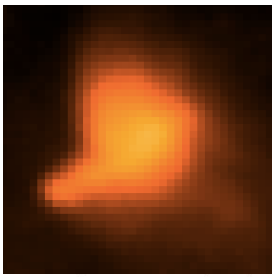


Dust Extinction vs. Emission

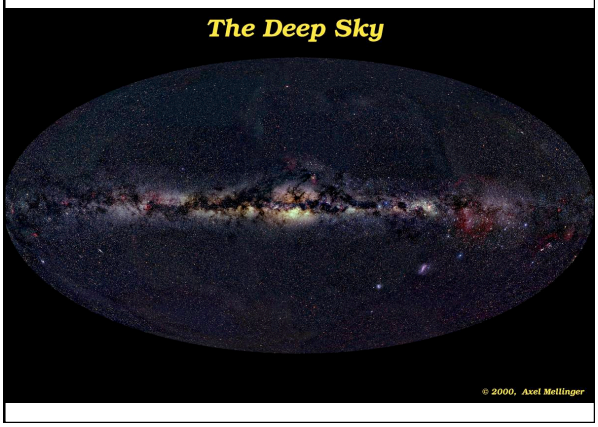
Optical Absorption/Scattering

Radio/Submillimeter (0.85 mm)
Thermal Emission

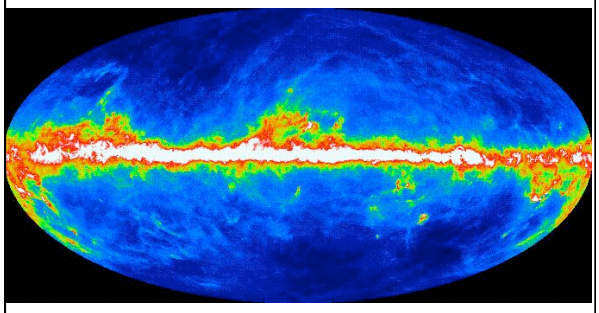
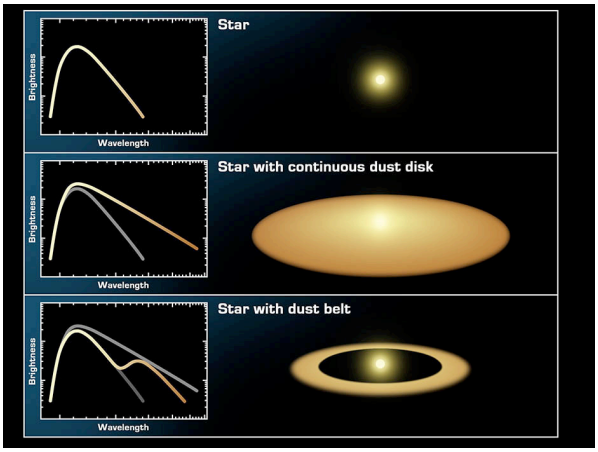




Bergin & Tafalla 2007 ARA&A



Milky Way 100 μm



IRAS/NASA