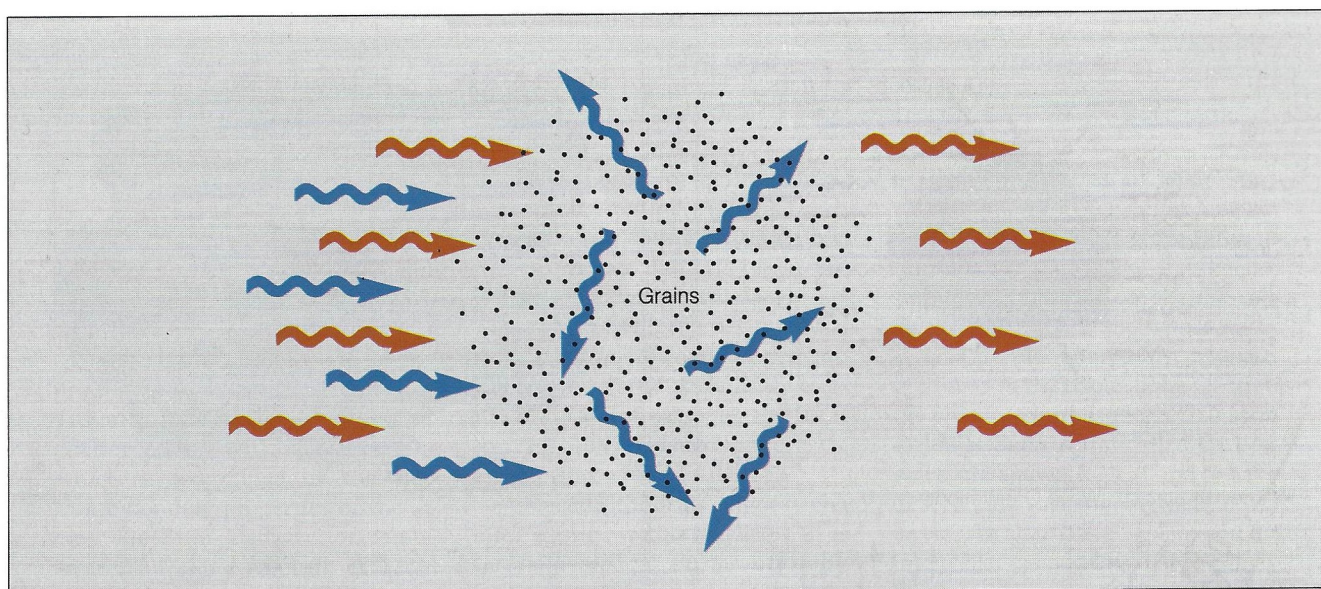


## Chapter 26. The Interstellar Medium

**Note.** In this section we consider the content of our galaxy in terms of objects other than stars.

**Note.** Dust grains make up a small part of the interstellar medium. They can be detected from (1) the fact that they block starlight from distant stars (this is called *interstellar extinction*), and (2) the polarization of starlight. The extinction of starlight is a combination of absorption and scattering of the light.

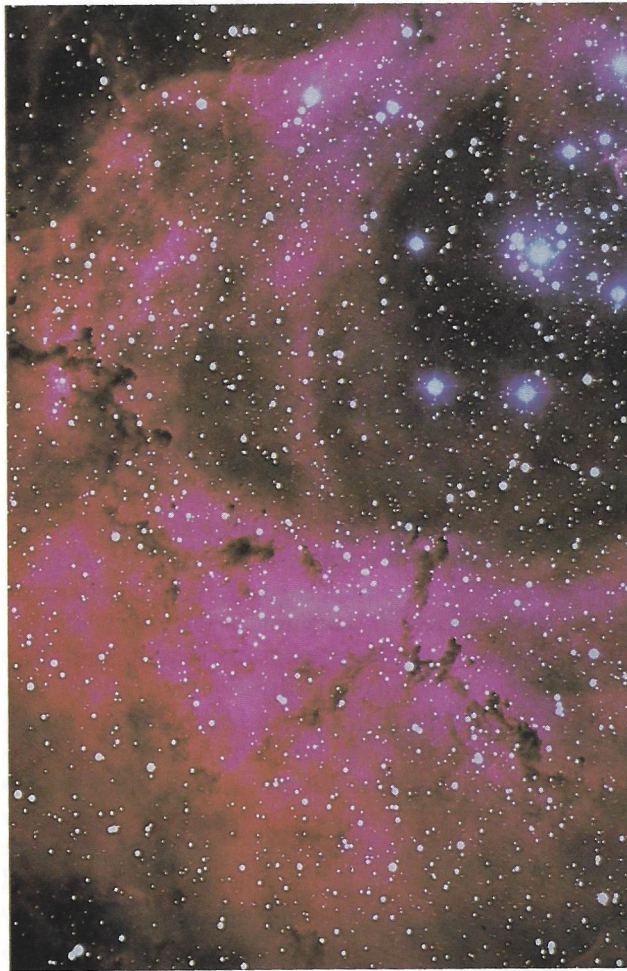


**Figure 26.5.** Scattering of light by interstellar dust grains.

**Note.** Interstellar dust is detected near newly formed stars, implying that it is created near the stars and pushed into space by stellar wind. It can also be expelled from the outer atmospheres of red giant and supergiant stars, and formed in the expanding atmospheres of novae and planetary nebulae.

**Note.** Interstellar gas can either obscure the light from distant stars behind it, or can result in bright, glowing gas.

**Note.** Interstellar material is not uniformly distributed and is often concentrated in *interstellar clouds*. The *diffuse clouds* are common and not hot enough to glow nor dense enough to show up as dark patches. They are essentially transparent, but if a hot star is embedded in such a cloud then its radiation can heat of the cloud until it glows as an *emission nebula*.



**Figure 26.12.** An emission nebula.

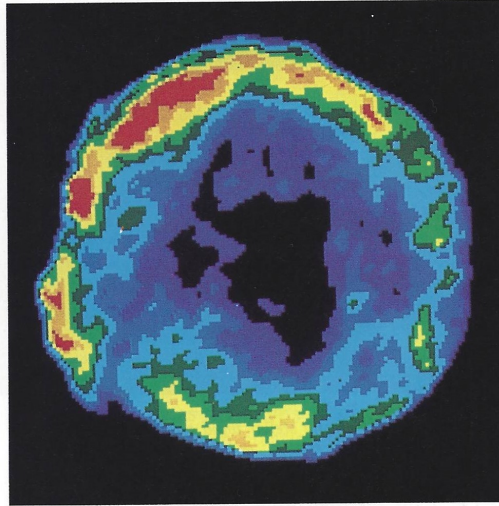
**Note.** A cloud that is just behind a hot star can result in a visible *reflection nebula*. It is the dust (not the gas) that causes the glow, resulting in a reflection of blue light.



**Figure 26.16.** The Pleiades.

**Note.** Dark clouds are highly concentrated in the plane of the Milky Way galaxy. These regions are where we see the most formation of new stars. The clouds obscure visible light, but radio emission lines can be detected. Such observations have revealed organic molecules (those containing carbon).

**Note.** The interstellar medium can be disturbed by supernova explosions. The expanding shell of gas from the explosion creates a cavity of hot gas. Stellar winds from large stars can also result in “bubbles” in the interstellar medium.



**Figure 26.19.** The remnant of Tycho's supernova of 1572.



**Figure 26.21.** A bubble created by a stellar wind.