MEDIO INTERESTELAR

MEDIO INTERESTELAR

- Medio interestelar (gas y polvo): 10% de la masa de la galaxia
- Frio, denso, estado molecular, vinculado a la formacion de estrellas
- Caliente, tenue, en el espacio inter-nubes moleculares
- De acuerdo a la fase en que se encuentre puede emitir desde radio hasta X
- Polvo: es el 1% del medio interestelar, 100 particulas por km cubico, granos de hasta 300 nm, absorbe visible y reemite en infrarrojo. Hidrocarbonos. Origen: condensacion en atmosferas K M o estrellas de carbono (convectivas con ciclo CNO)
- Gas: es el 99% del medio interestelar, 1 atomo por cc, puede ser calentado, excitado, ionizado por estrellas proximas. Basicamente H y He.
- Rayos cosmicos acelerados por campos magneticos.
- Gas de la corona de la galaxia

EFECTOS DEL POLVO EN LA LUZ

- Extincion interestelar
- Dispersion y reflexion
- Enrojecimiento
- Polarizacion
- Emision entre IR y radio

CLASIFICACION DE NEBULOSAS DE GAS

- Oscuras, o emision MASER
- Reflexion, reflejan el espectro de las estrellas proximas
- Regiones HI, 21 cms
- Regiones HII, rodean a estrellas O B, lineas de emision con emision termica en radio
- Nebulosas “planetarias”, similar a HII
- Remanentes de supernova, lineas de emision y continuo no termico en radio (sincrotron)

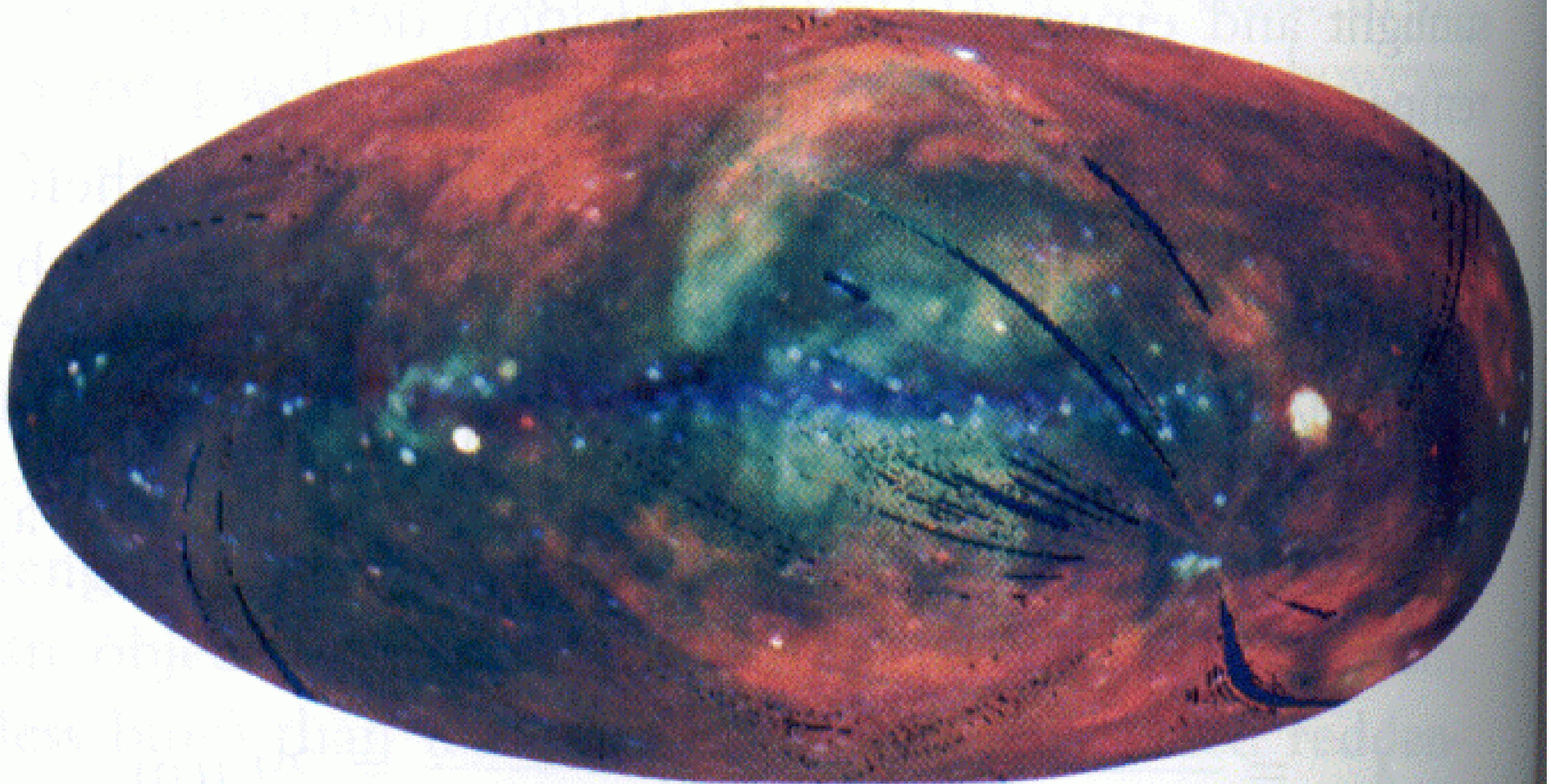


Figure 14.5 *The faint X-ray glow that fills the sky is due largely to emission coming from the bubble of million-kelvin gas which surrounds the Sun. Bright spots are more distant sources, including objects such as bubbles of very hot, high-pressure gas surrounding the sites of recent supernova explosions.*

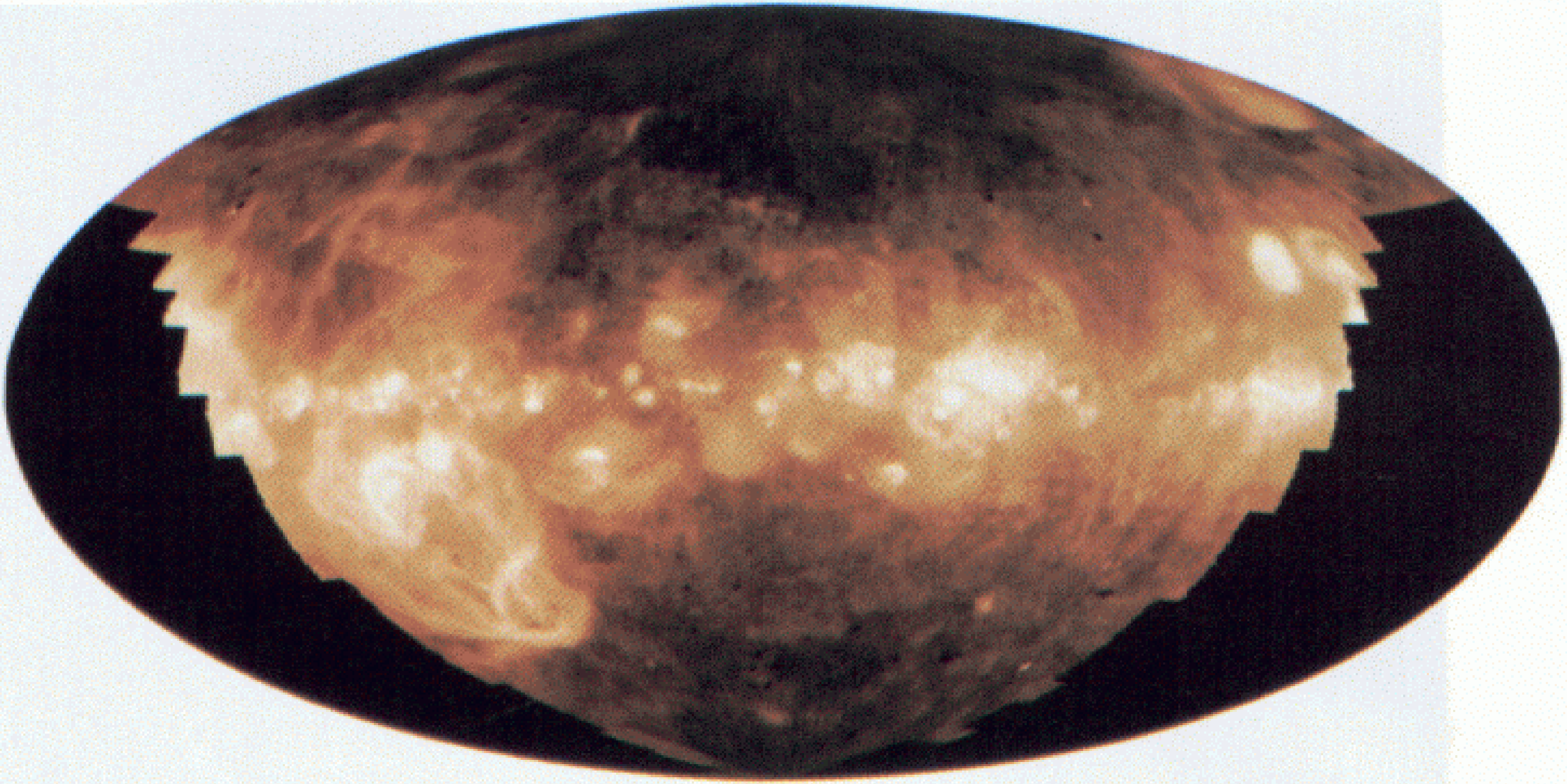


Figure 14.6 *Warm (about 8,000 K) interstellar gas glows in the Hα line of hydrogen. This image, showing the Hα emission from much of the northern sky, shows how complex the structure of the interstellar medium is.*

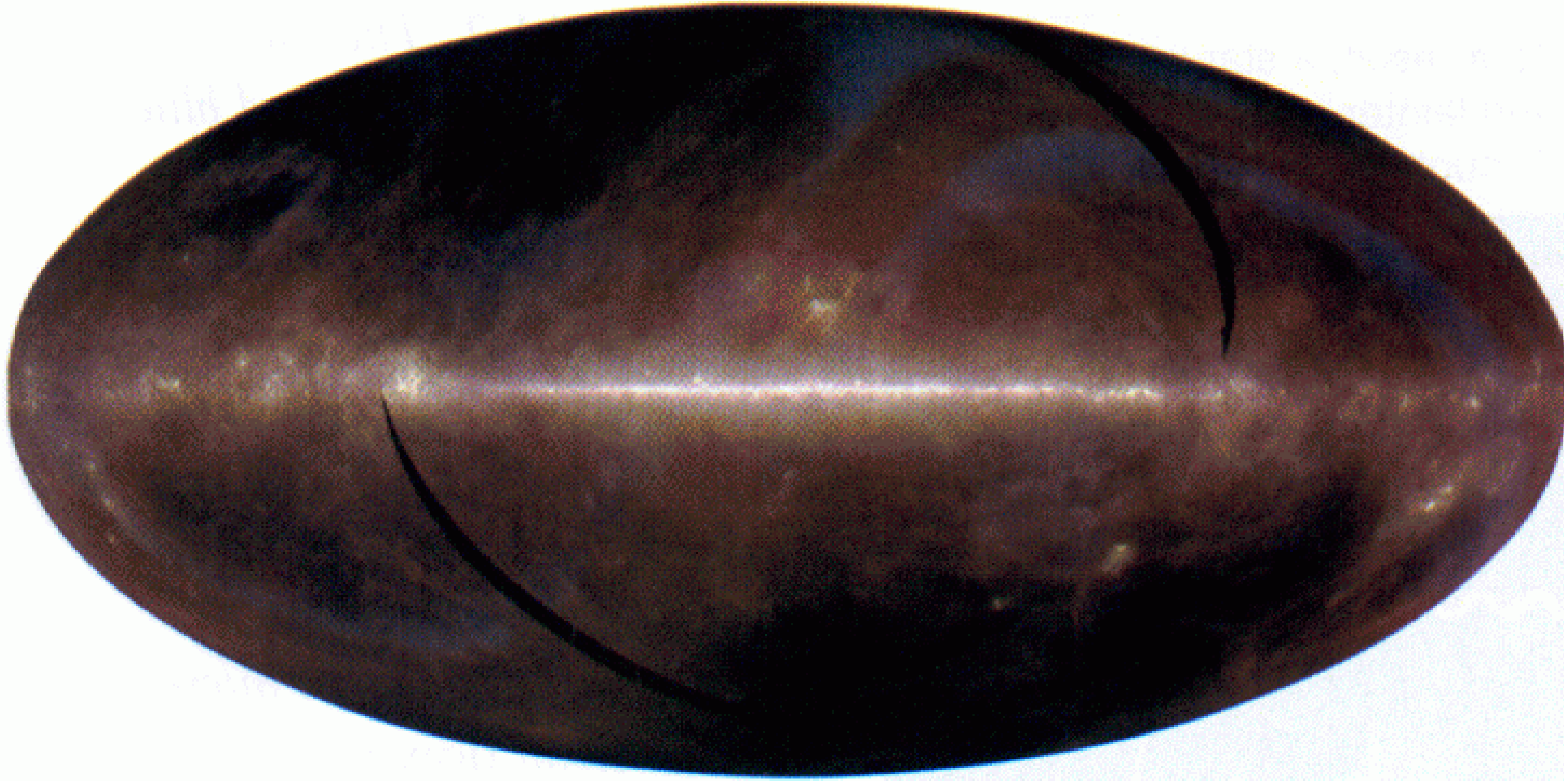


Figure 14.4 *Far infrared images of the sky show clouds of warm, glowing interstellar dust. (Black bands are due to missing data.)*

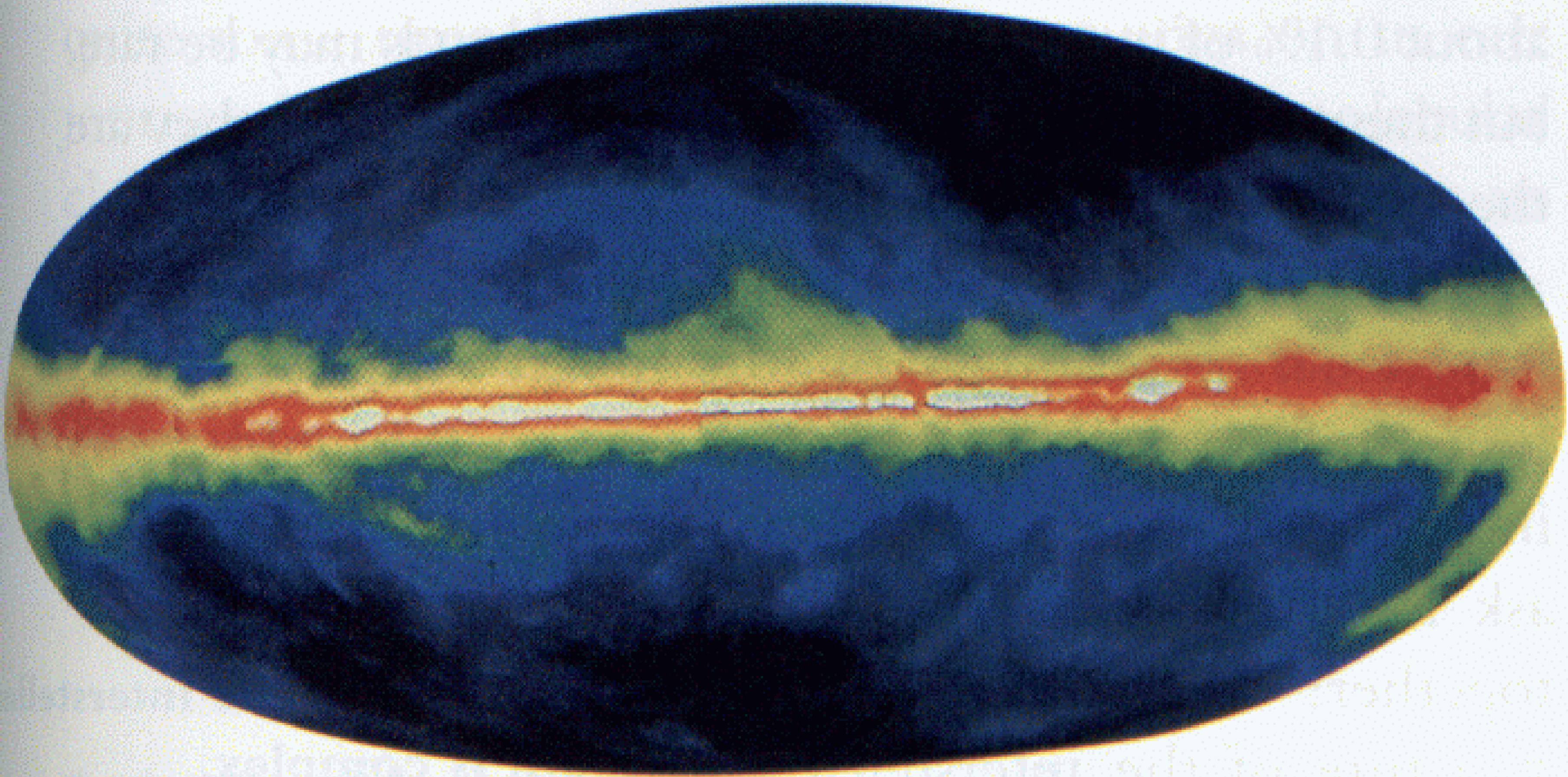
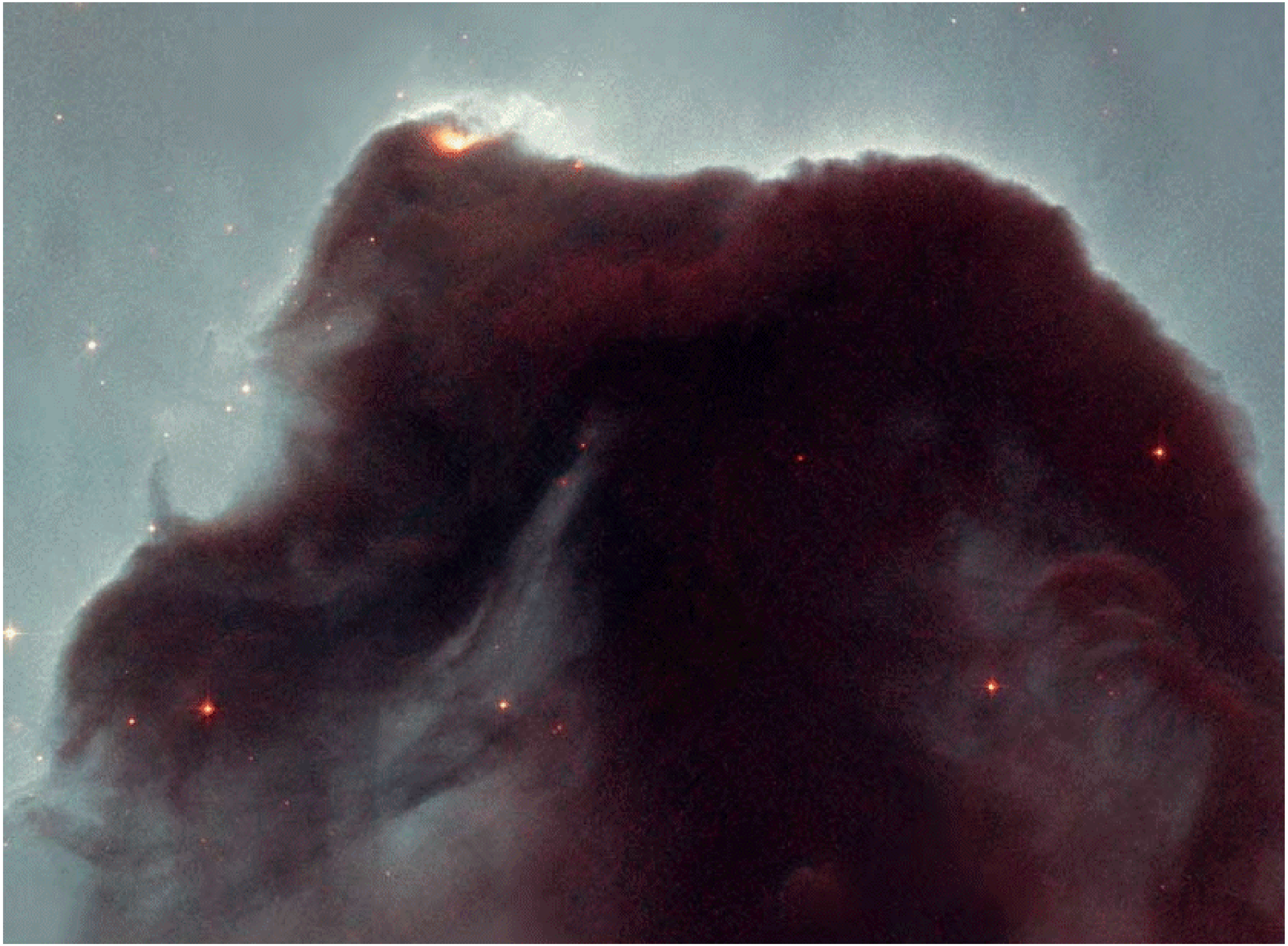


Figure 14.9 *This radio image of the sky taken at a wavelength of 21 cm shows clouds of neutral hydrogen gas throughout our Galaxy. Because radio waves penetrate interstellar dust, 21-cm observations are a crucial probe of the structure of our Galaxy.*

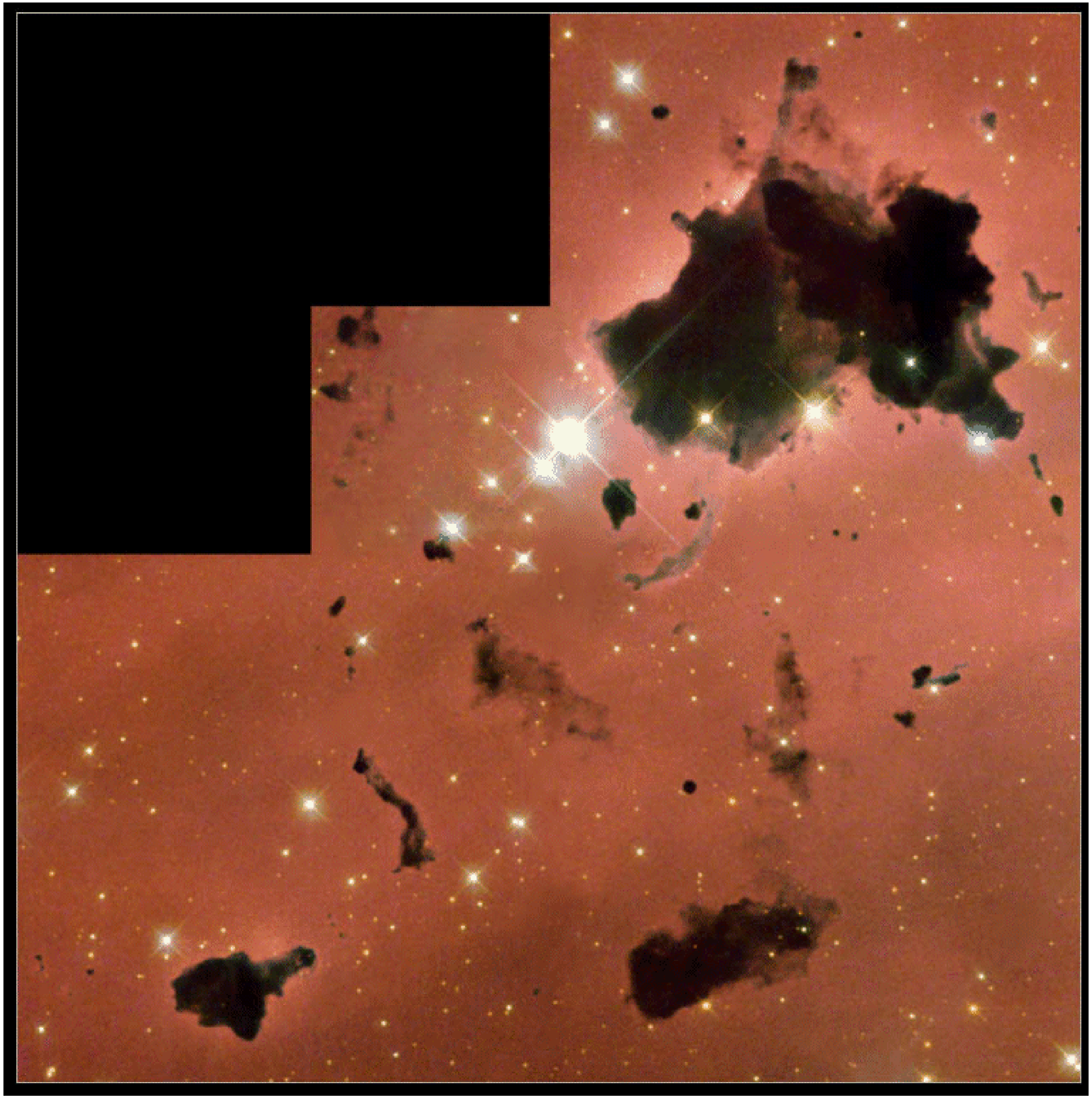
Table 18.1 Typical States of Gas in the Interstellar Medium

State of Gas	Primary Constituent	Approximate Temperature	Approximate Density (atoms per cm^3)	Description
Hot bubbles	Ionized hydrogen	1,000,000 K	0.01	Pockets of gas heated by supernova shock waves
Warm atomic gas	Atomic hydrogen	10,000 K	1	Fills much of galactic disk
Cool atomic clouds	Atomic hydrogen	100 K	100	Intermediate stage of star–gas–star cycle
Molecular clouds	Molecular hydrogen	30 K	300	Regions of star formation
Molecular cloud cores	Molecular hydrogen	60 K	10,000	Star-forming clouds



Keyhole Nebula

Hubble Heritage



Globulos

de Bok

Bow Shock Around LL Orionis

Polvo

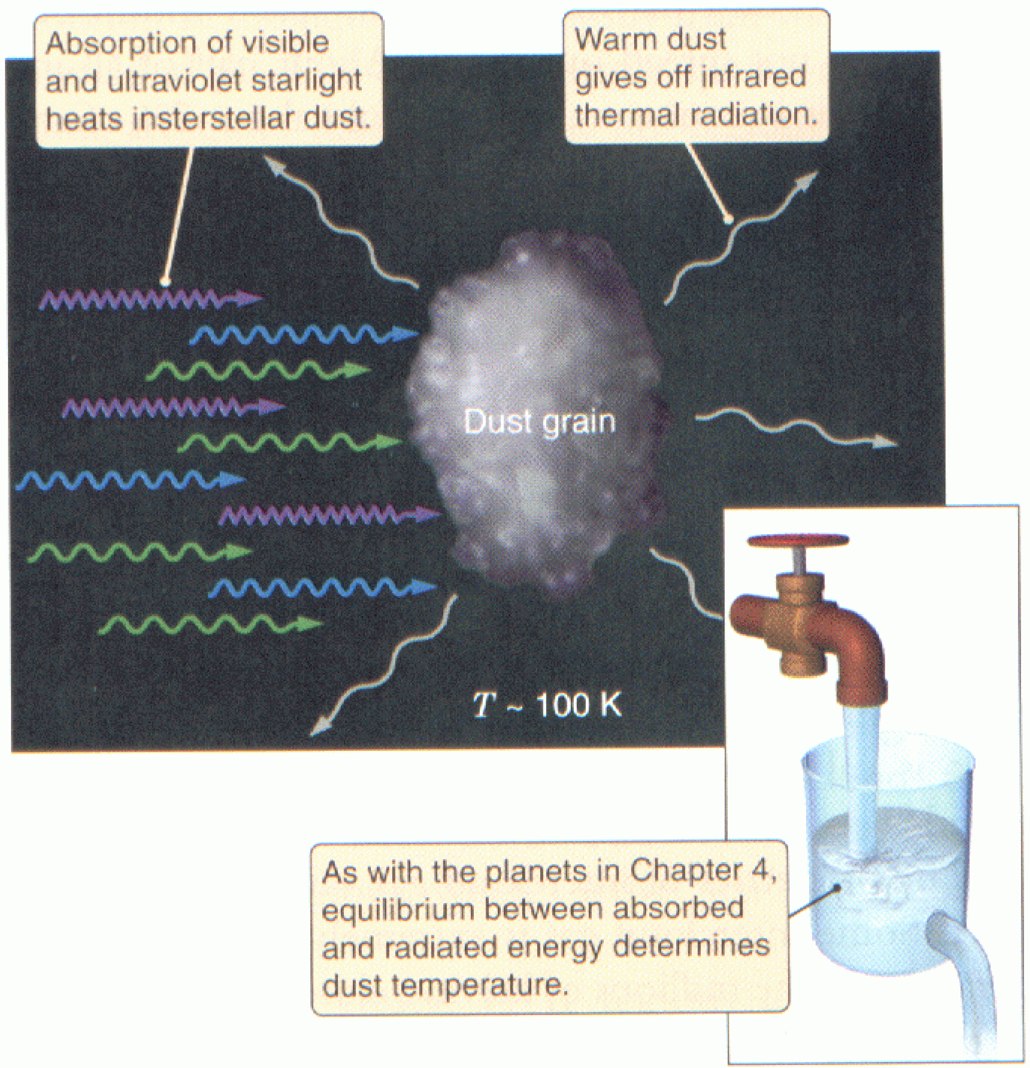
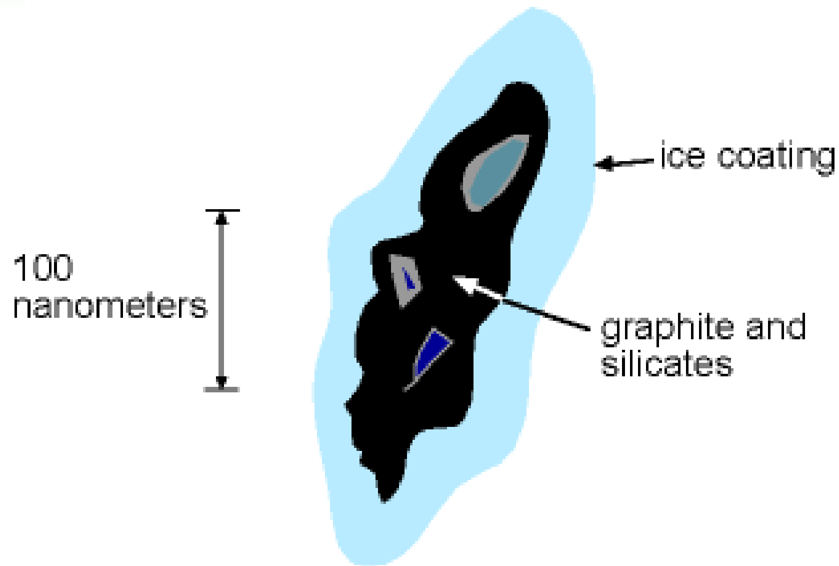


Figure 14.3 *The temperature of interstellar grains is determined by the same type of equilibrium between absorbed and emitted radiation that determines the temperatures of planets.*



A typical dust grain (note the tiny scale!).

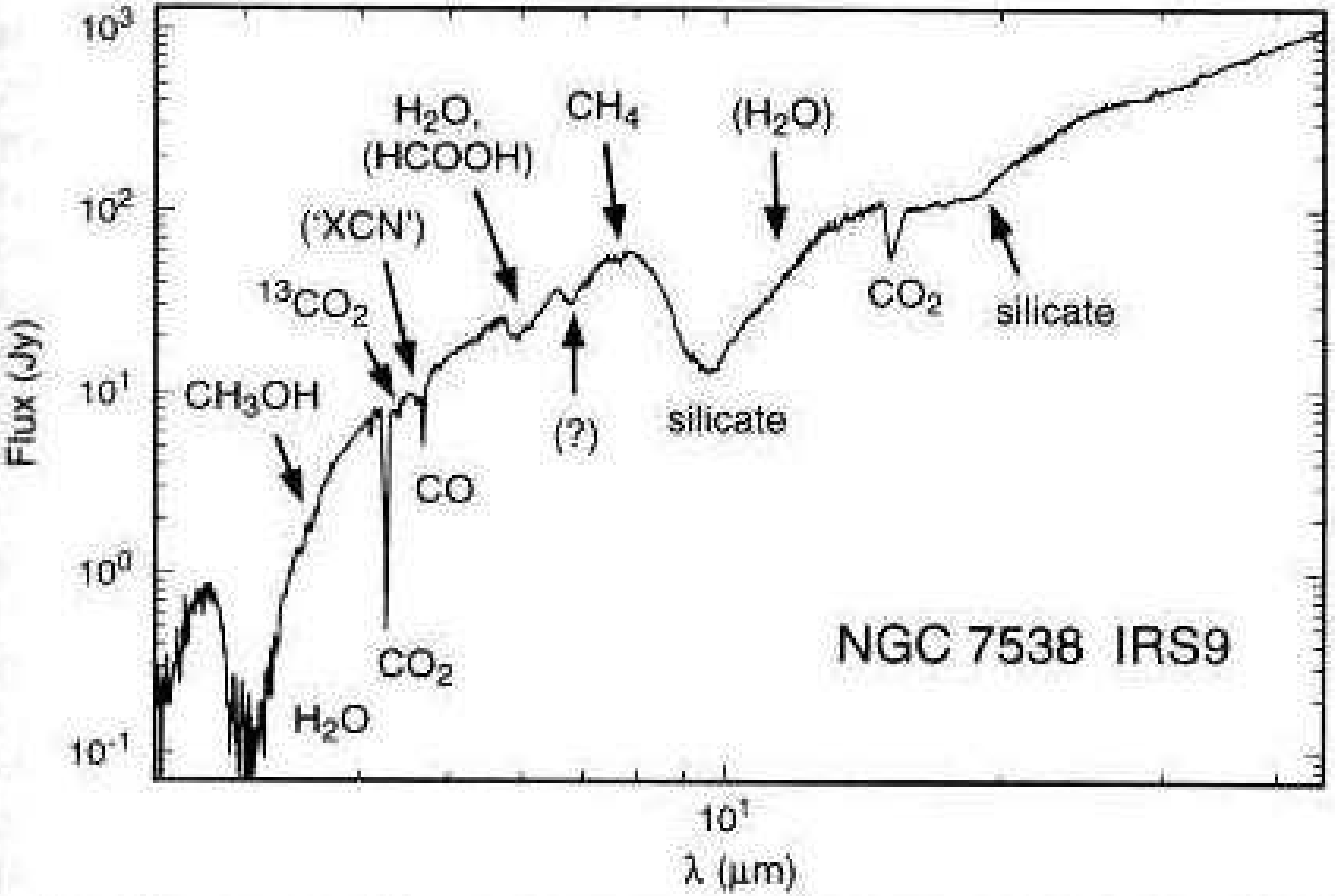
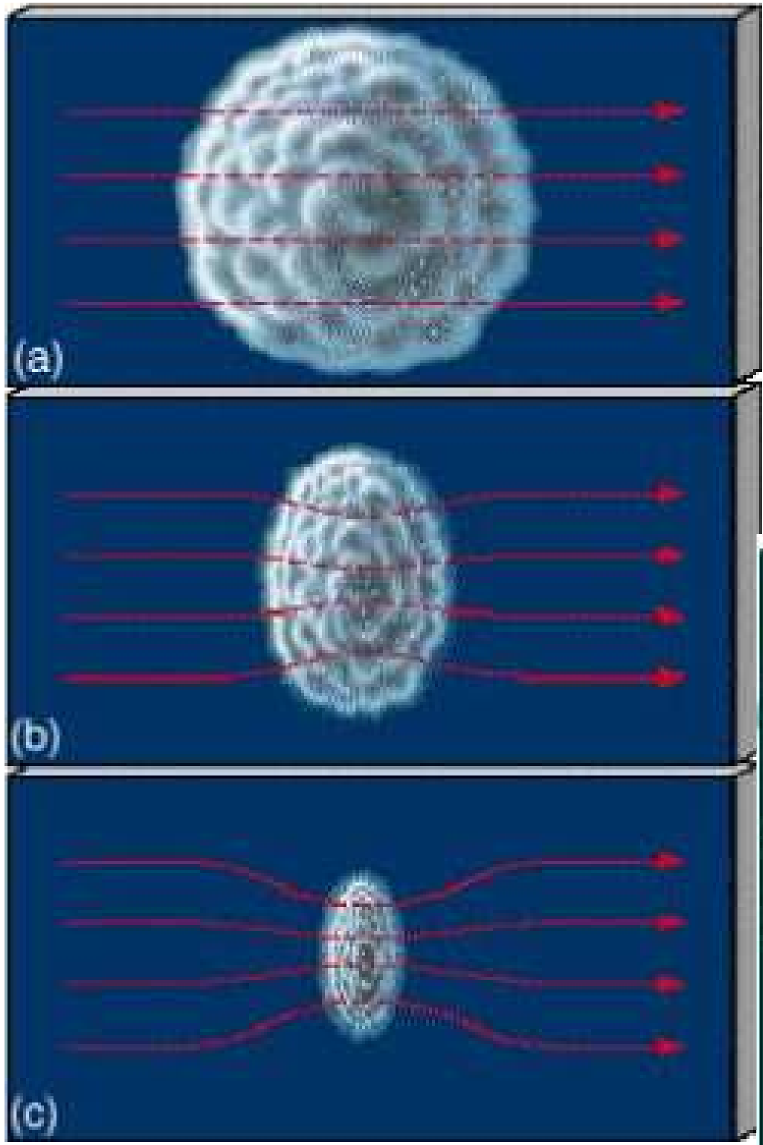
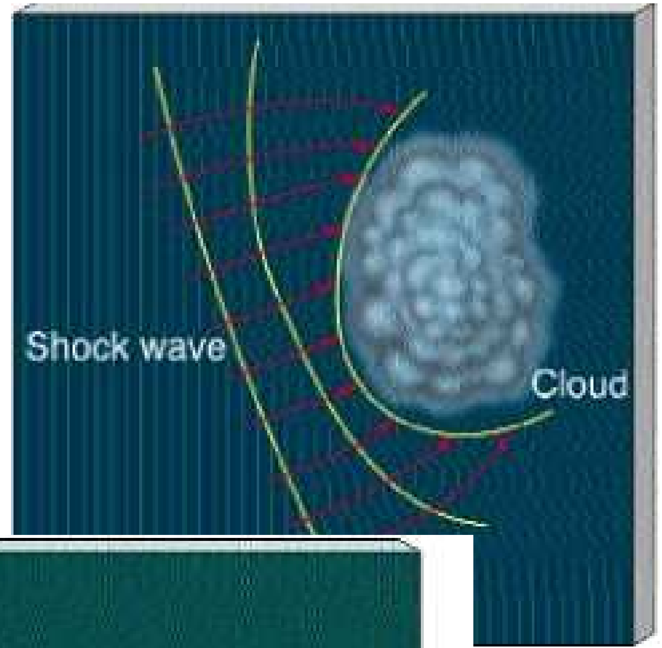
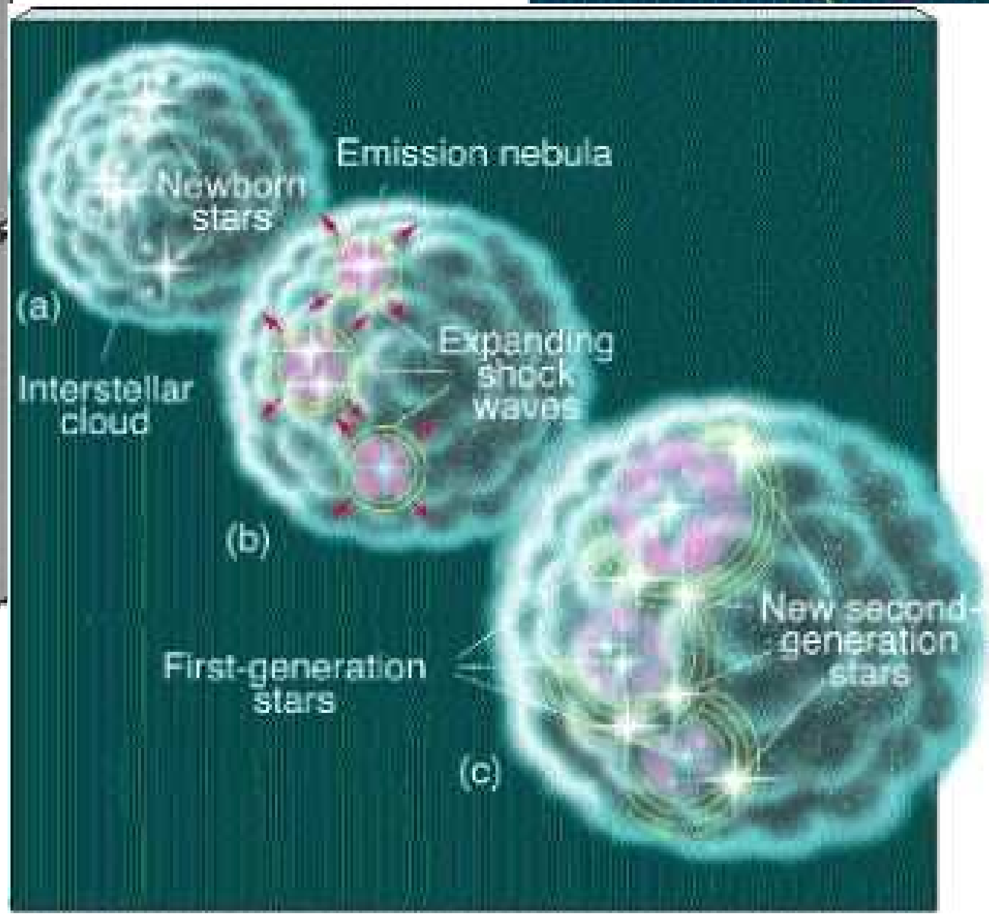
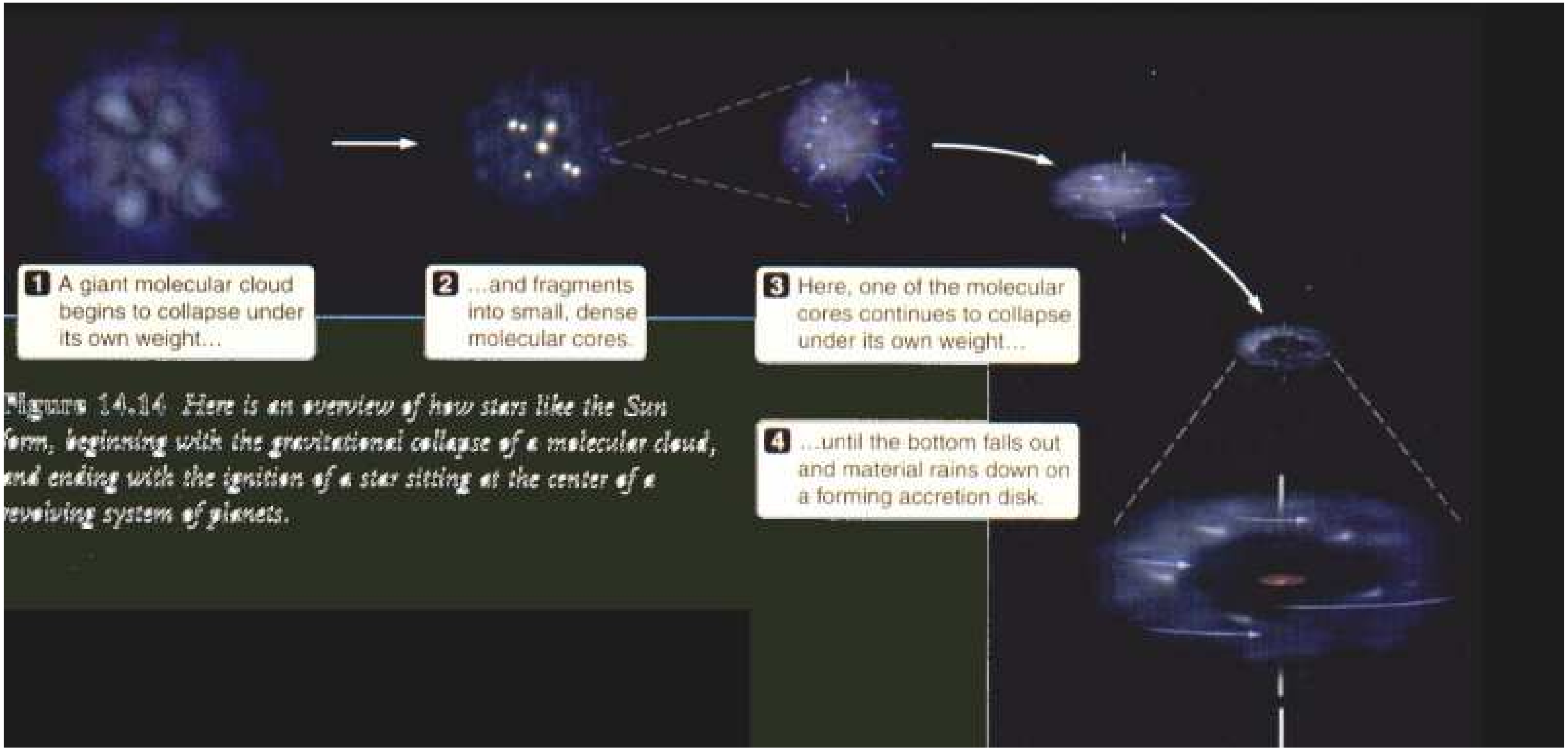


FIGURE 9.10. Spectrum of the cold interstellar molecular cloud NGC 7538 IRS9, from 2.5 to 45 μm. Absorption features due to various solid constituents of interstellar grains are identified (Wh96).

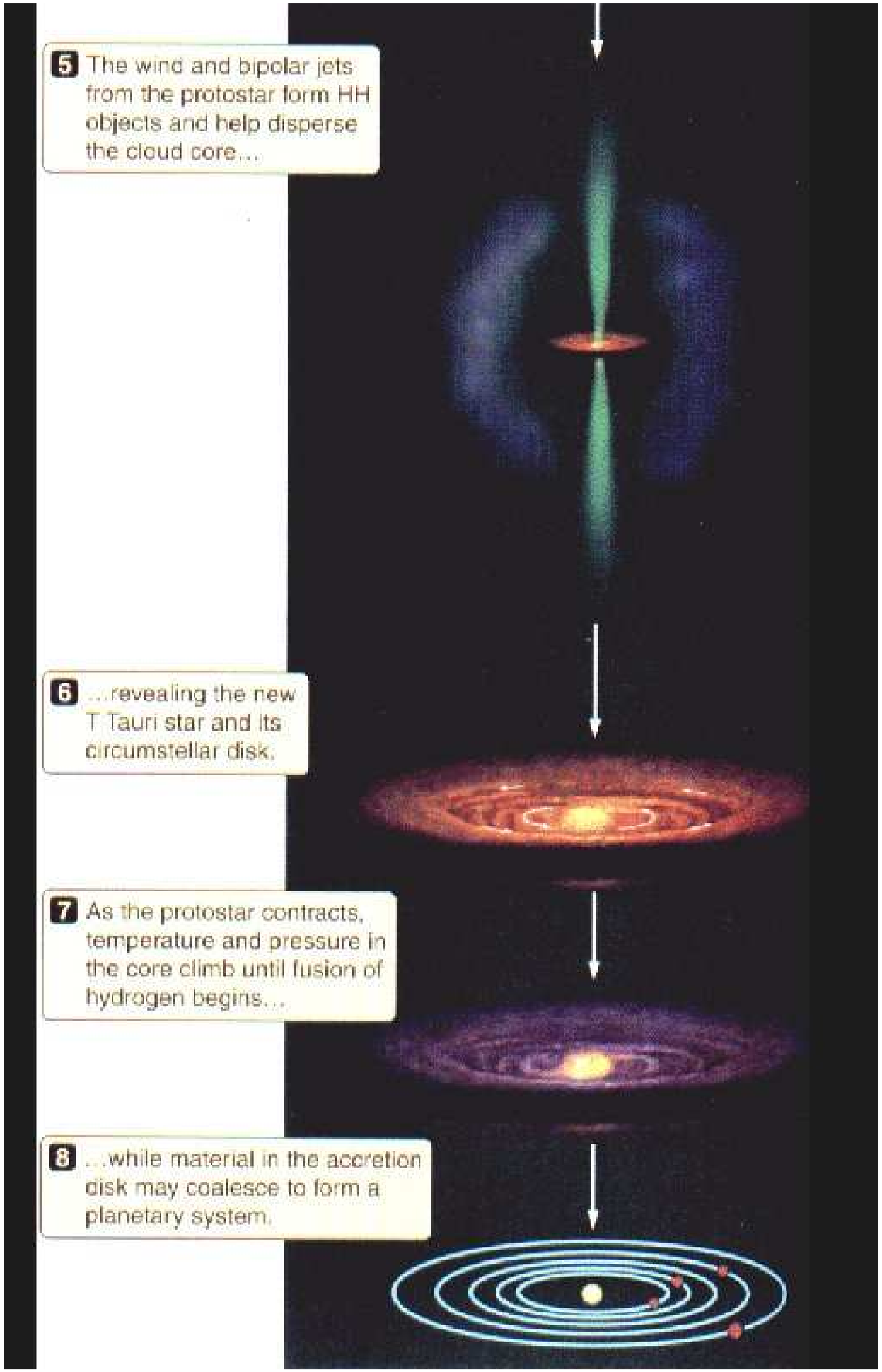

(a)
(b)
(c)


Shock wave
Cloud


Emission nebula
Newborn stars
(a)
Interstellar cloud
Expanding shock waves
(b)
First-generation stars
New second-generation stars
(c)



Formación de estrellas



- Flujo bipolar
- T Tauri y disco
- Litio alto
- Fusion H
- Planetas

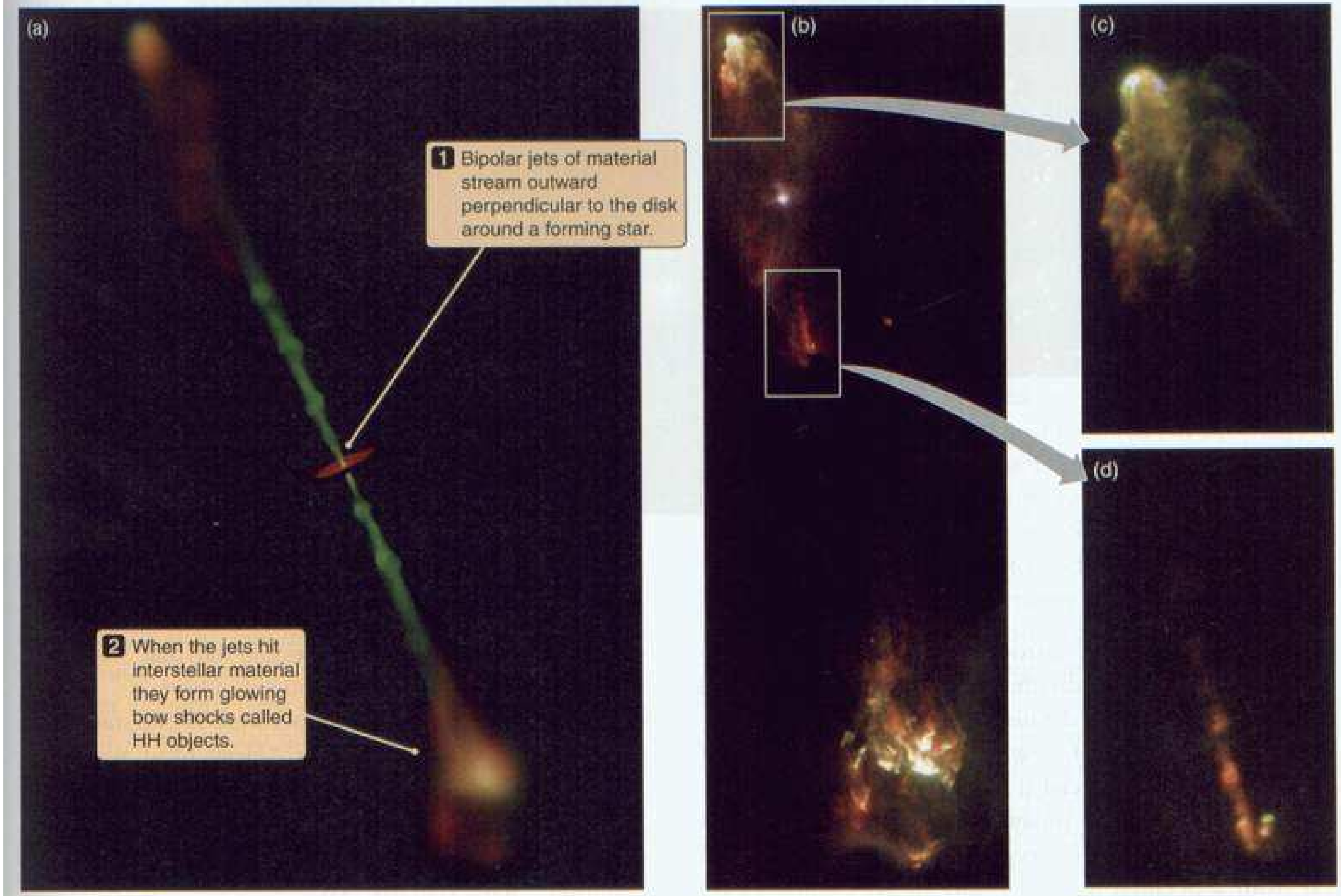
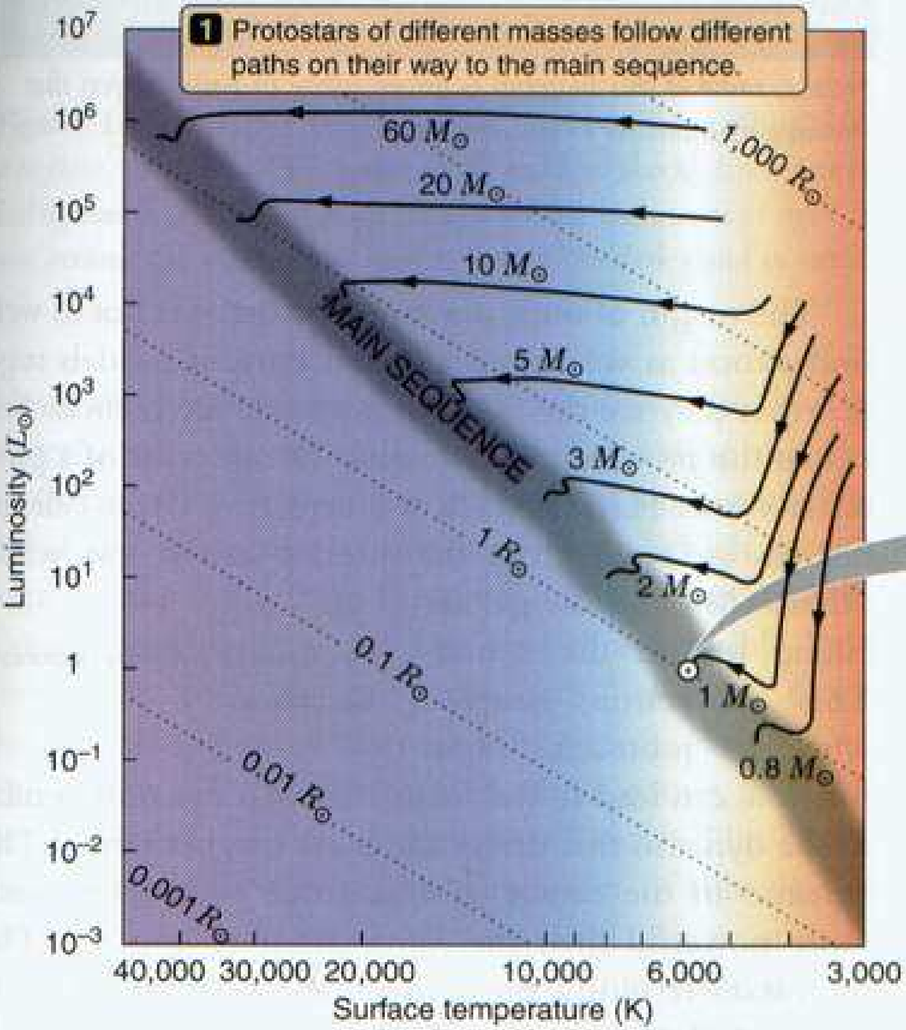


Figure 14.20 (a) *Jets from protostars slam into surrounding interstellar gas, heating the gas and causing it to glow.* (b) *This HST image shows the bow shocks formed at the ends of a bipolar jet from a protostar. Enlargements of the bow shock* (c) *and jet* (d) *are shown at right. Only one side of the jet itself can be seen because the other side is hidden behind the dark cloud in which the star is embedded.*

Objetos Herbig Haro



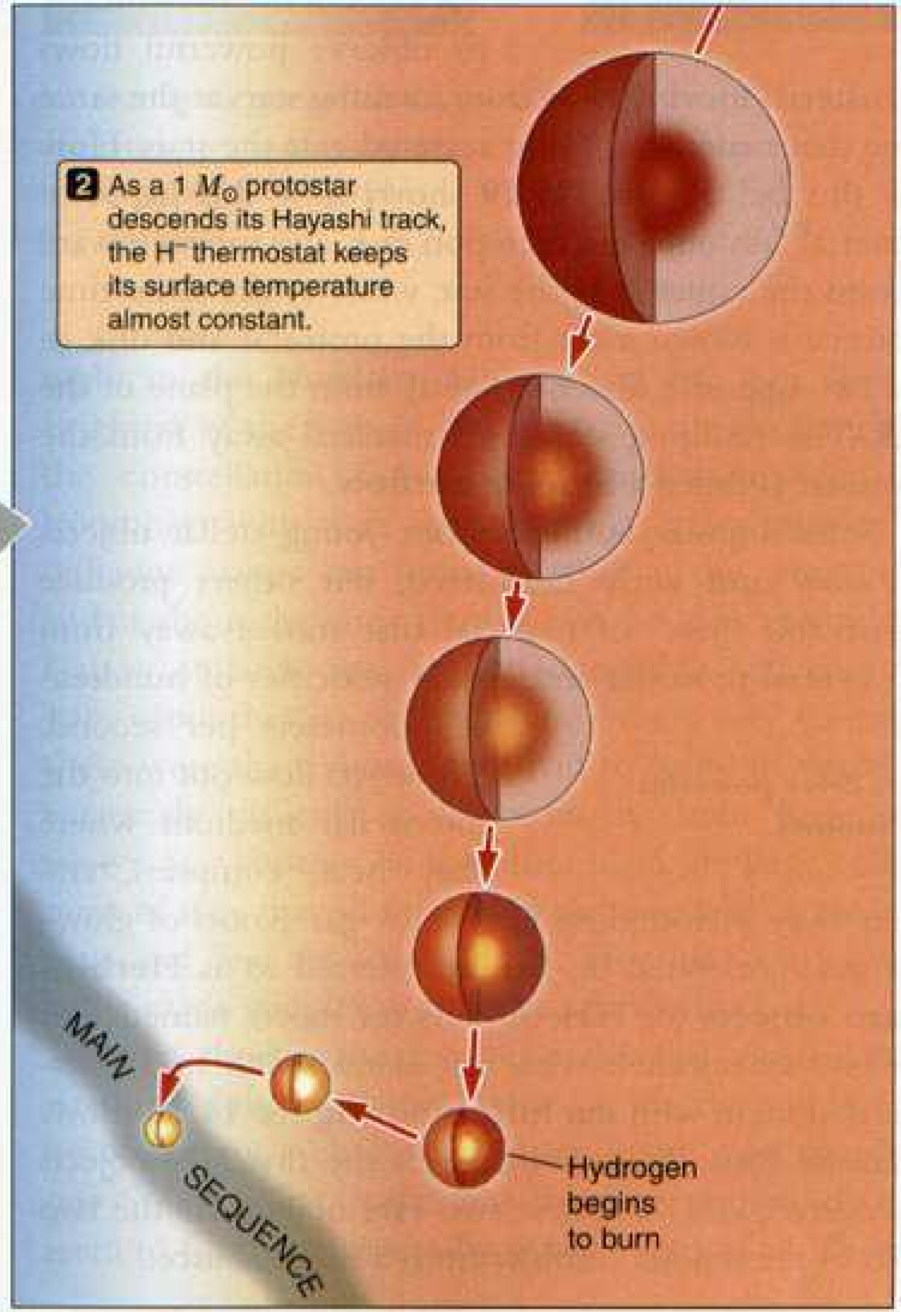


Figure 14.18 *The evolution of pre–main sequence stars can be followed on the H-R diagram. Protostars in the upper right portion of the diagram are large and cool. The roughly vertical, constant-temperature parts of the evolutionary tracks of low-mass protostars are referred to as "Hayashi tracks."*

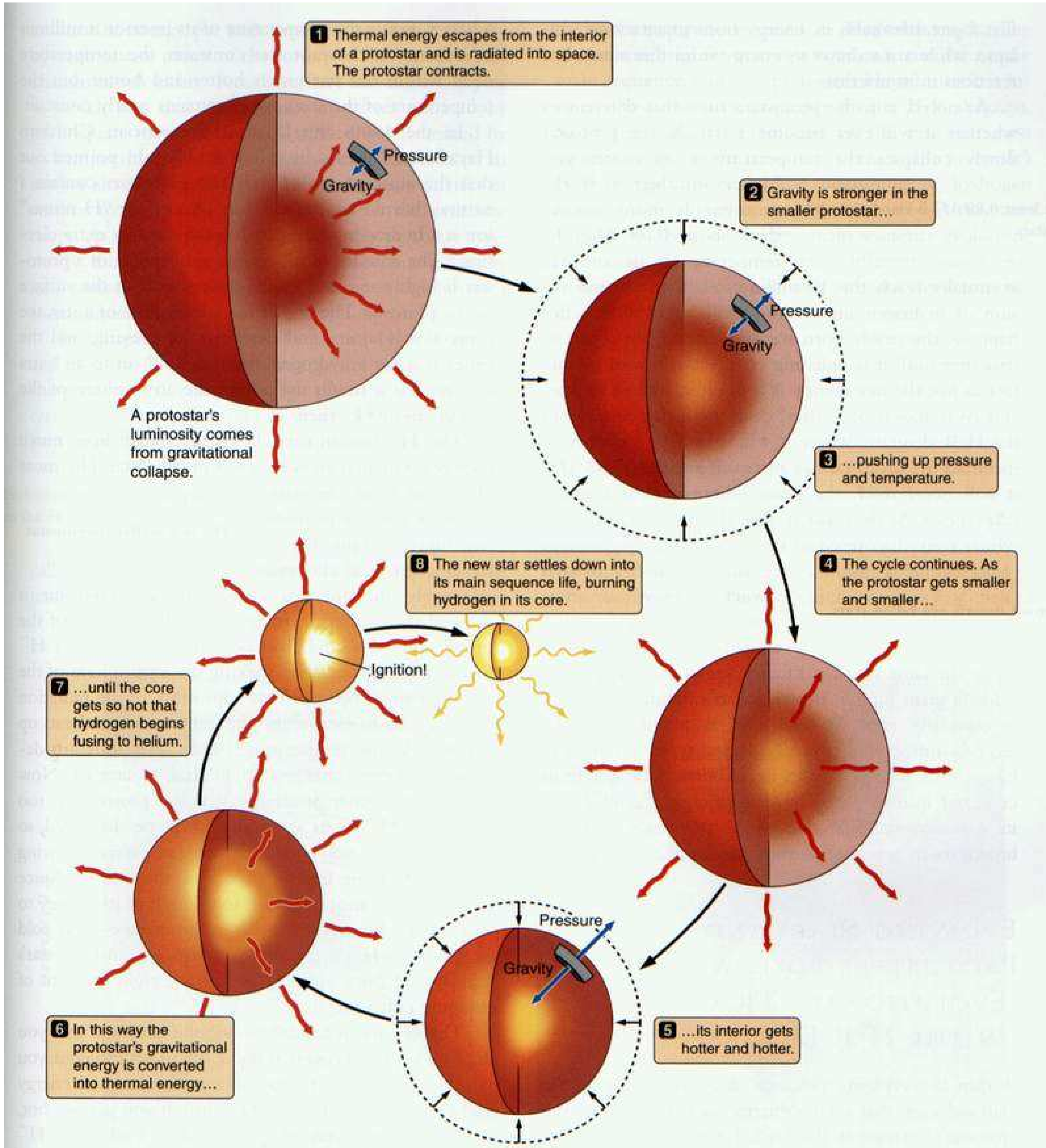
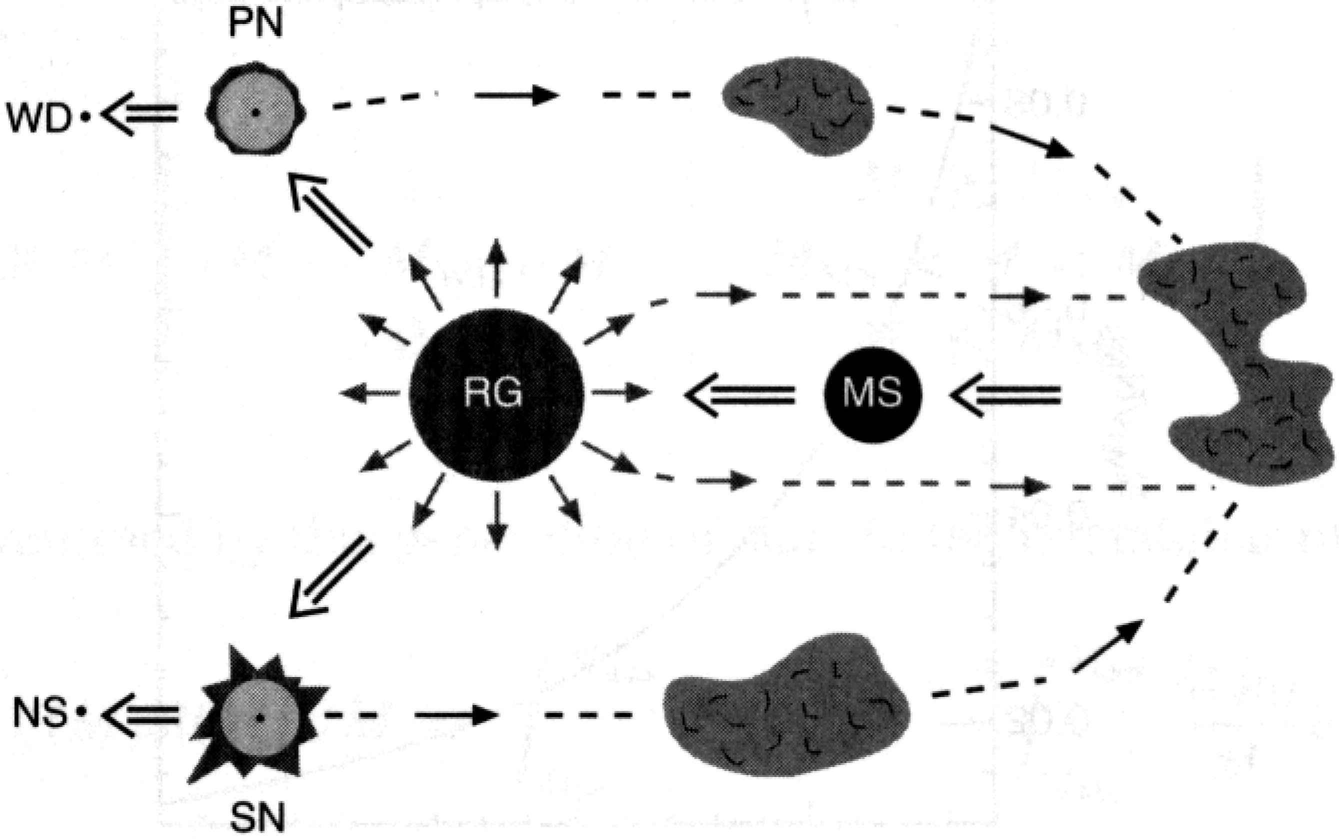


Figure 14.17 *As a protostar radiates away energy, it loses pressure support in its interior and contracts. This contraction drives the interior pressure up. The counterintuitive result is that radiating energy away causes the interior of the protostar to grow hotter and hotter until nuclear reactions begin in its interior.*


PN
WD
RG
MS
NS
SN

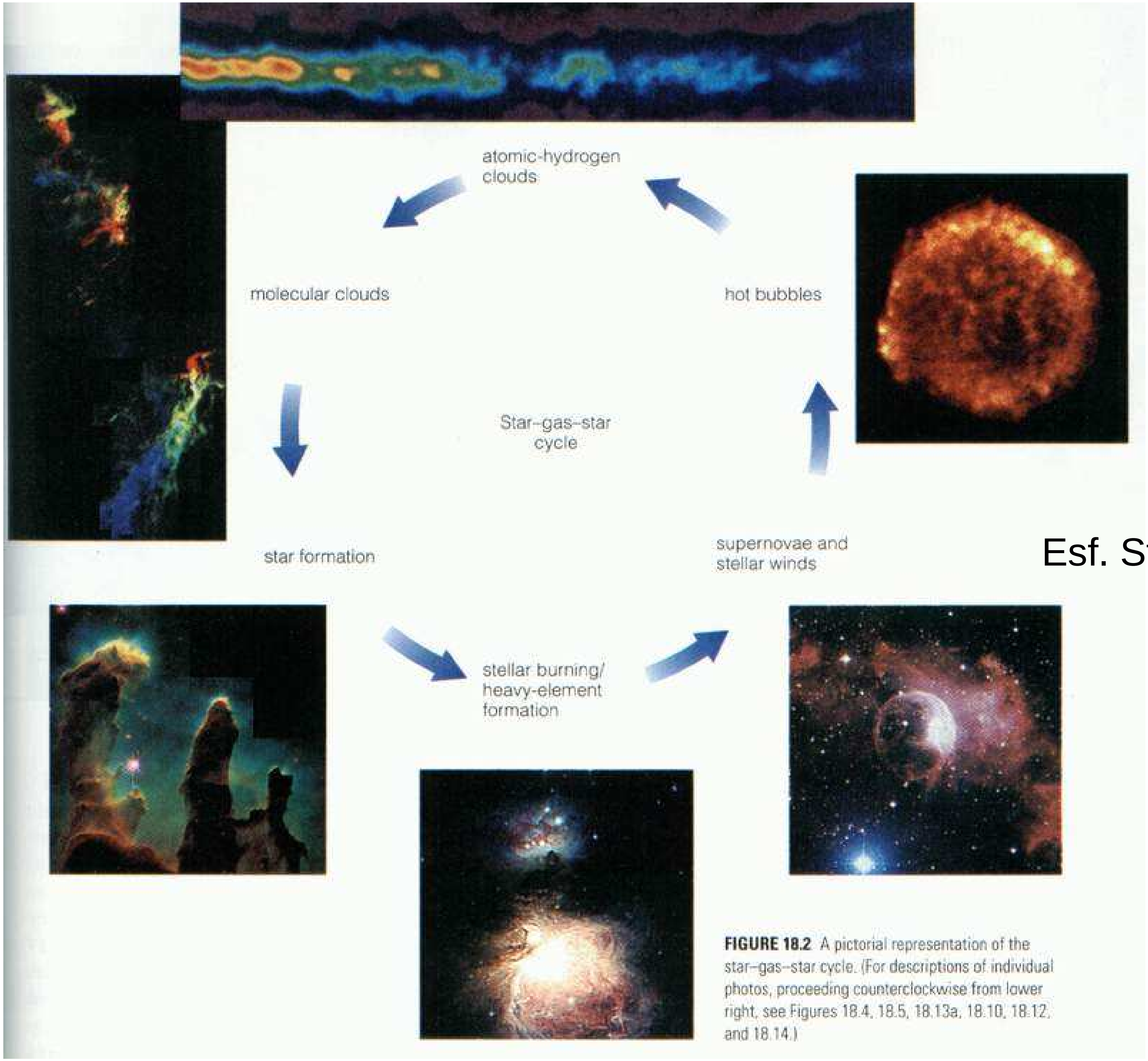


FIGURE 18.2 A pictorial representation of the star–gas–star cycle. (For descriptions of individual photos, proceeding counterclockwise from lower right, see Figures 18.4, 18.5, 18.13a, 18.10, 18.12, and 18.14.)

Esf. Stromgren

Flujo de

Rayos

Cósmicos

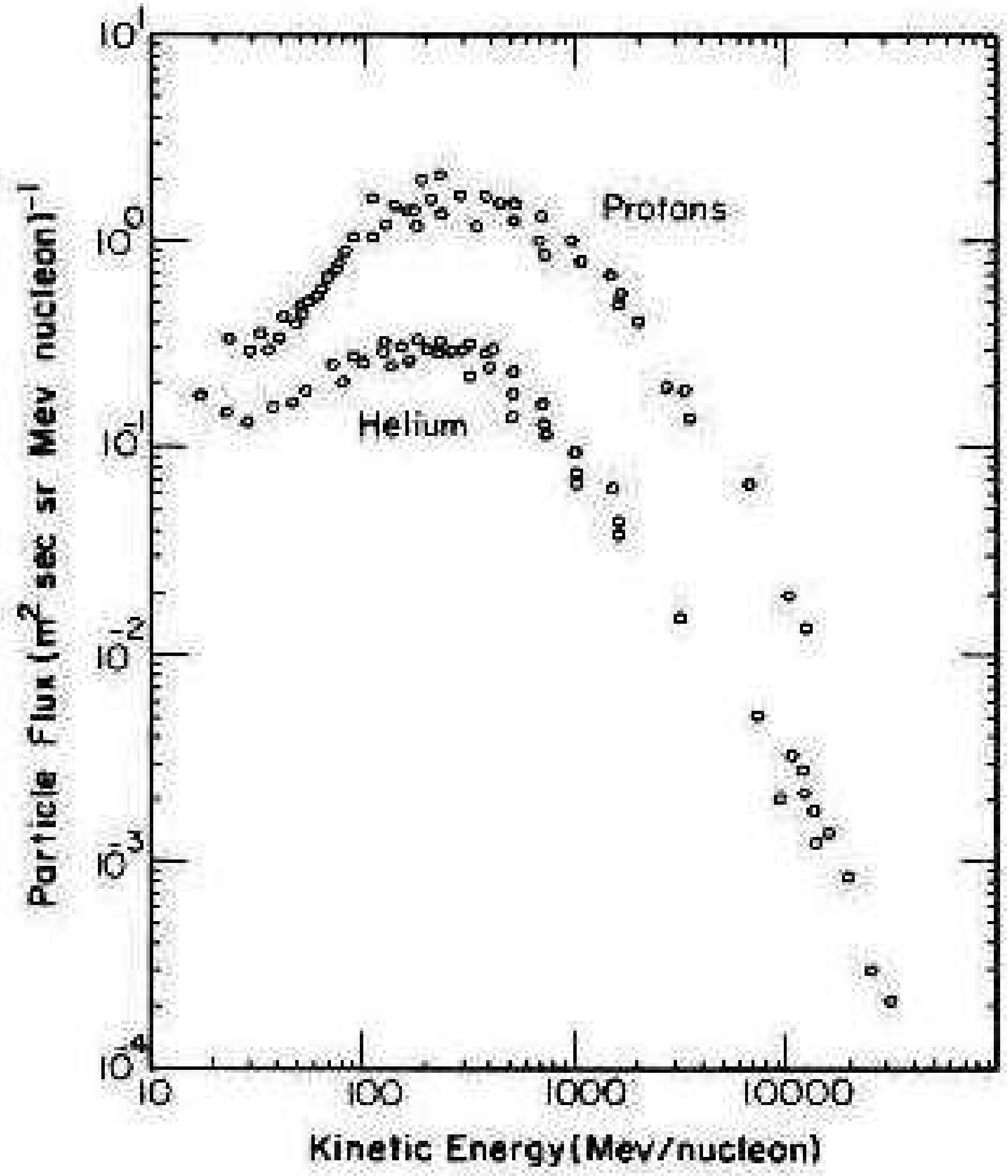


FIGURE 9.8. Proton and alpha particle cosmic ray flux at the Earth. At any given energy the proton flux is about one hundred times as intense as the electron flux. (Compiled from various sources by P. Meyer (Me69). Reprinted with permission from *Annual Review of*

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