

銀河系外觀結構

扁平的部分及球狀的部分

- **中央突起 (nuclear bulge)** :
直徑約 20,000 光年 ; 星球與雲氣集中之處
- **銀河盤面 (galactic disk)** :
直徑約 100,000 光年 ; 厚度約 2,000 光年 ;
恆星、氣體、塵埃、螺旋臂、磁場、
宇宙射線
- **銀河包暈 (galactic halo)** :
球狀星團所在的球型區域 ; 很少雲氣及塵埃

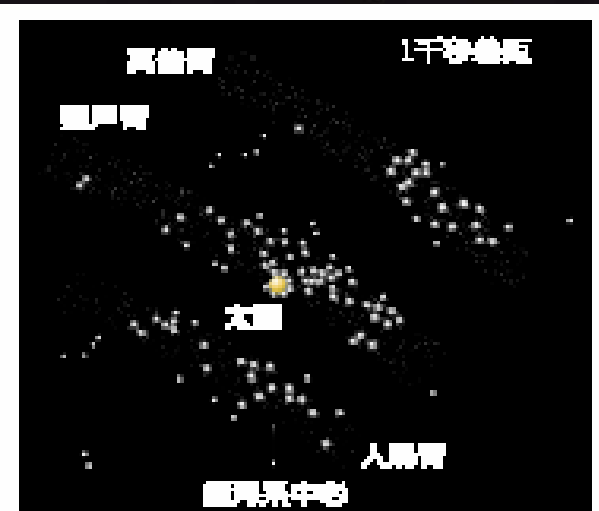
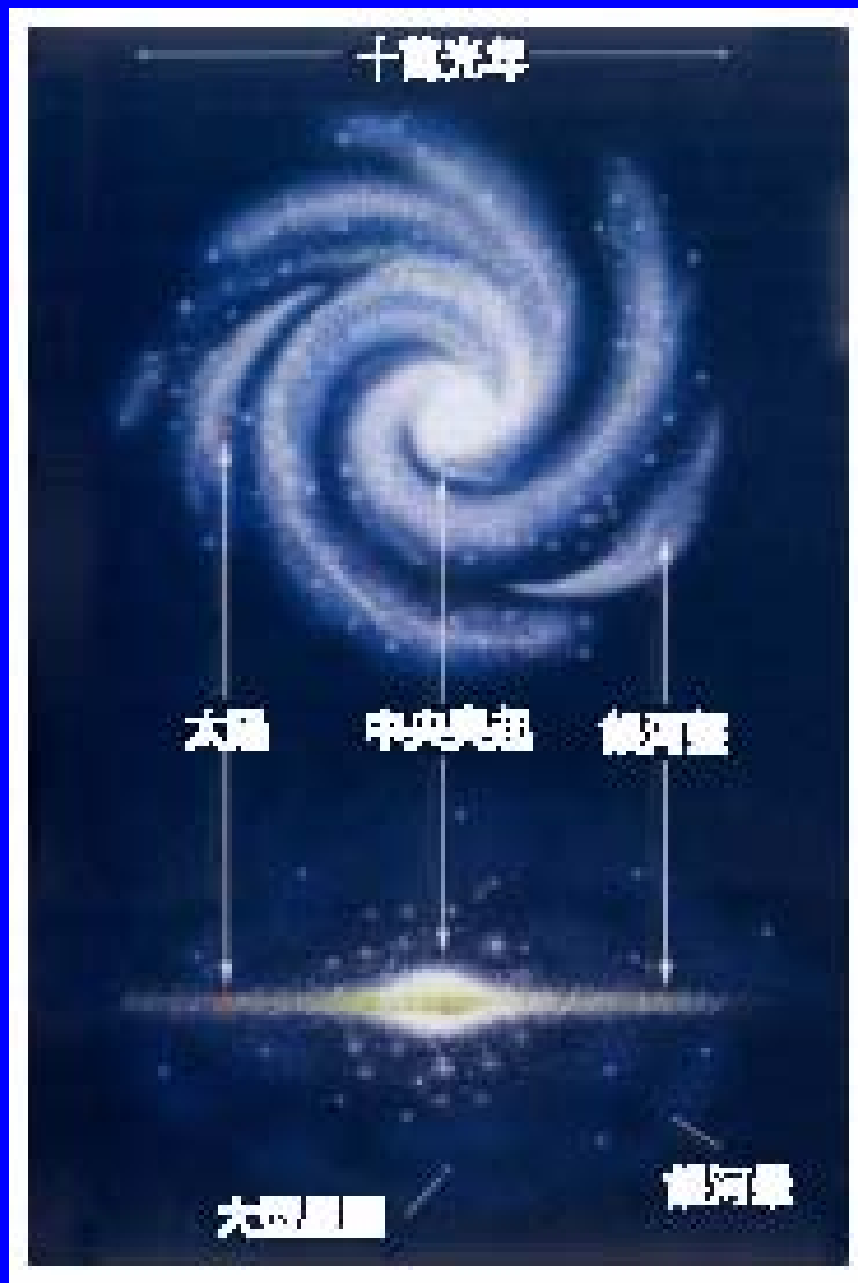
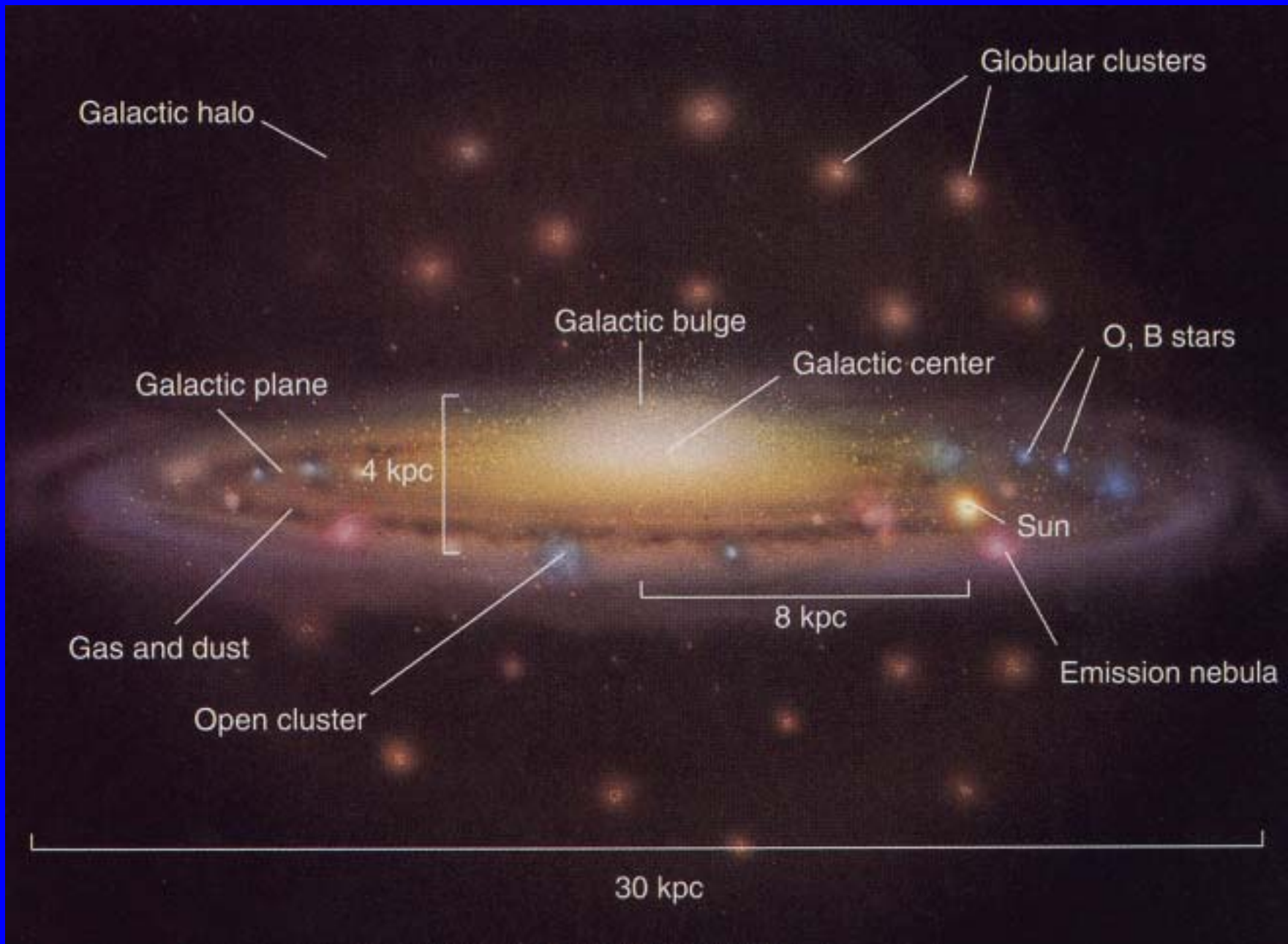
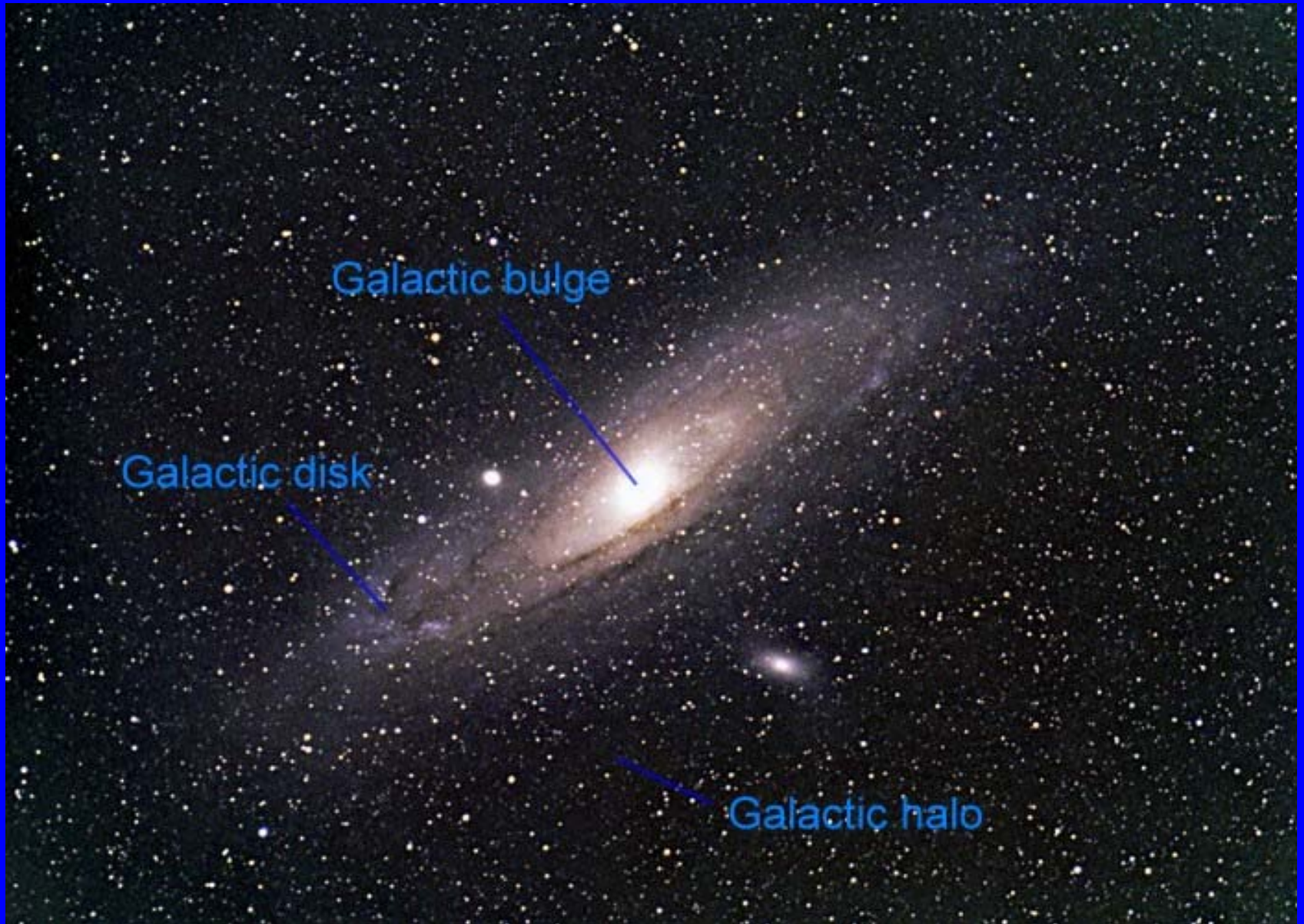


圖 7-12 太陽附近的 OB 亮星分布成三個片段。太陽在獵戶座旋臂內側。





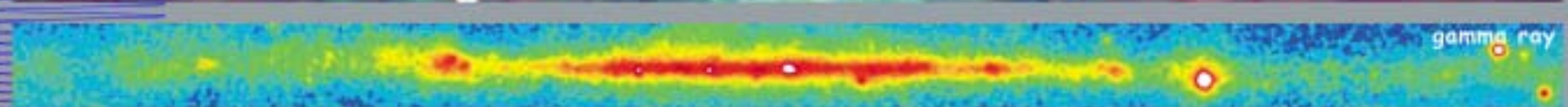
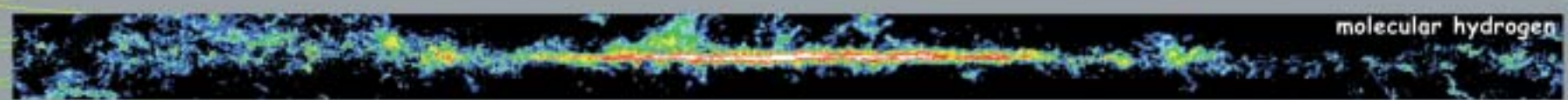
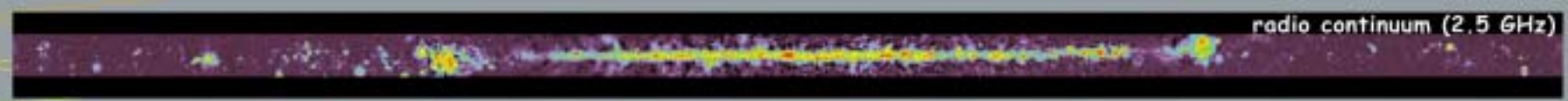
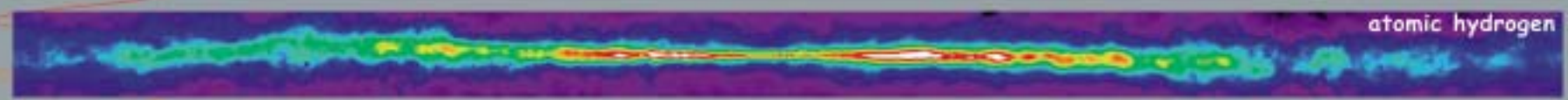
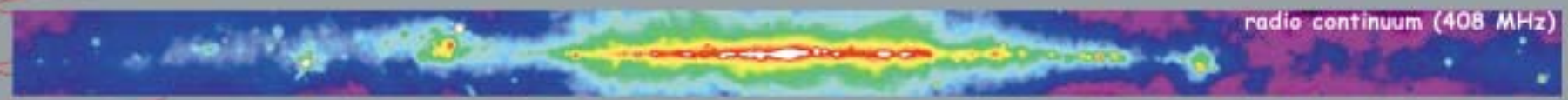
Galactic bulge

Galactic disk

Galactic halo



側向 (edge-on) 著我們的螺旋星系可以看到核心突起的部分



<http://adc.gsfc.nasa.gov/mw>



Multiwavelength Milky Way

Stellar Population

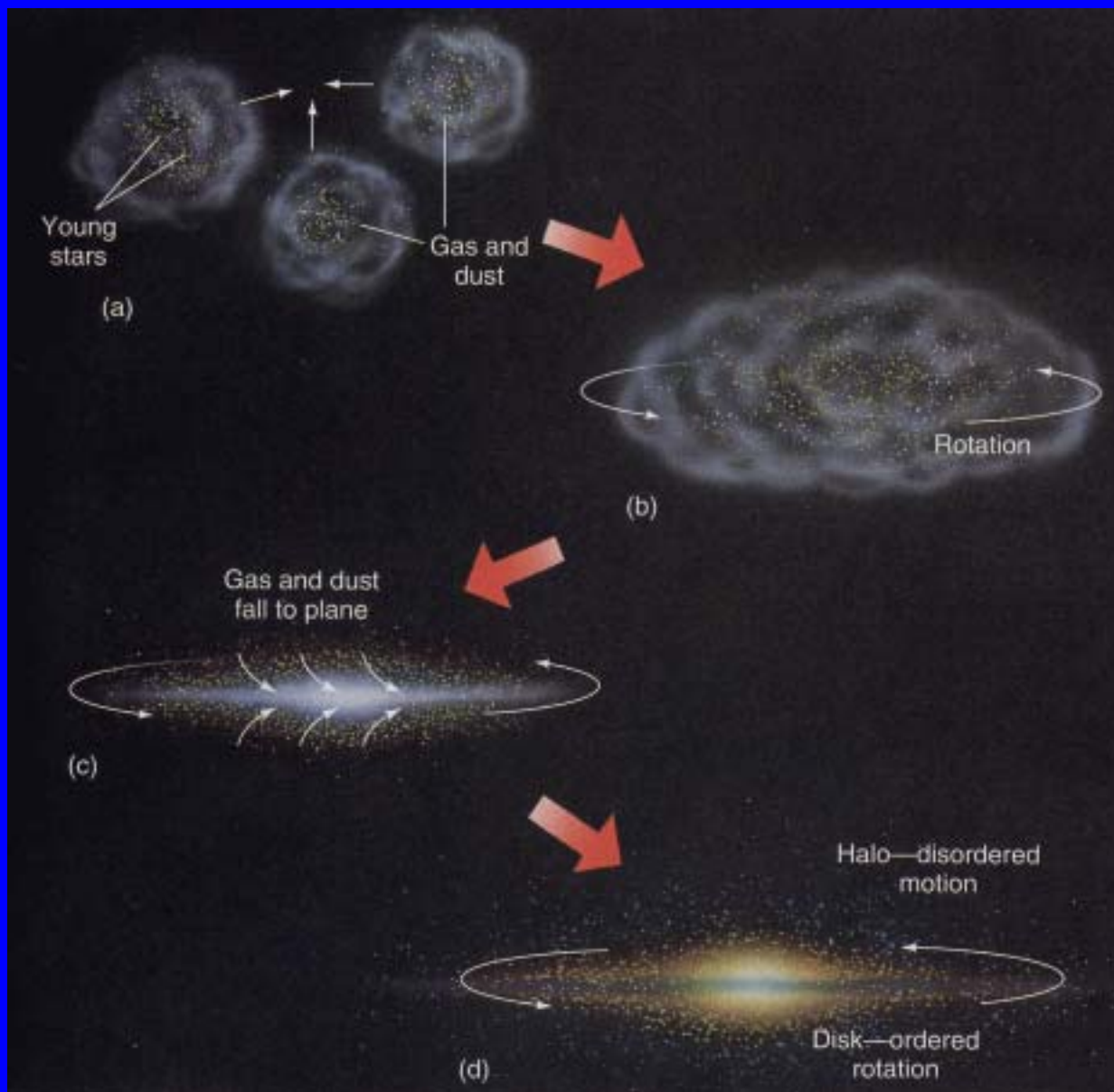
- Baade (1944, in LA, Mt Wilson) on nearby ellipticals, and spheroidal components of spirals
 - **Pop I** --- luminous blue stars,
associated with dust and gas
 - **Pop II** -- luminous red stars,
in gas- and dust-free environment
- Open clusters and stellar disks -- Pop I
- Globular clusters, galactic spheroids, and elliptical galaxies -- Pop II

- Now understood as an evolutionary sequence: globular clusters and spheroid of the Milky Way (Pop II) formed first, with the Pop I stars in the disk forming later.

Population I stars --- young and metal rich

Population II stars -- old and metal poor

- $[\text{Fe}/\text{H}] = \log N(\text{Fe})/N(\text{H}) - \log (N(\text{Fe})/N(\text{H}))$
observed value from +1 (some stars in the central bulge of the Milky Way) to -2.3 (most metal-poor globular clusters)



形成銀河系的
雲氣收縮
→ 球狀星團
形成後留在
原地，旋轉
的雲氣則繼
續收縮，成
為銀河盤，
其中製造了
新一代恆星

- But even the most metal-poor stars in the Milky Way contain trace amounts of heavy elements, which they could not have synthesized themselves
 - Pop III stars of even earlier generation?
- Yet need observational evidence

Thin disk

- double exponentials, both in radial direction (scale height of a few kpc) and in z (scale height of a few hundred pc)
- stars move in almost circular orbits around the Galactic center
- \sim solar abundances; lower abundances with increasing galactocentric distances
- At the location of the Sun, the disk is ~ 300 pc thick, or $1/100$ of its diameter

Stellar halo

- globular clusters and field stars
- globular clusters: halo globulars and disk globulars, with morphological, kinematic, and chemical differences

Dark halo

- the massive surrounding component that causes the flat rotation curve

Bulge

- part of the disk? separate component?
center of the halo?
- Metal abundances from very low to way above solar

Thick disk

- scale height $\sim 1-2$ kpc in the solar neighborhood, with almost all old population
- Stars 7-10 Gyrs
- Thickness too great to account for by slow drift after birth