Multiples, Clusters, Variables, and Nebulae are stellar arrangements that are not themselves galaxies but are usually found orbiting a galactic core. For more information, see pages 29-36 of our text.

Multiples. Most stars have at least one companion bound by gravitational attraction.

	Description	*Notes*
Physical Multiples	A small number of stars orbiting a common center of mass.	*Eclipsing* binaries vary in light intensity as one star passes in front of another.
Optical Multiples	Stars that seem to be close together because they appear along the same line of sight.	*Spectroscopic* multiples can only be resolved through light emissions analysis.

Variables – stars whose apparent brightness appears to fluctuate. Most stars have some variation in luminosity, e.g. our Sun varies in luminosity by 0.1% over an 11 year solar cycle.

		Description	*Notes*
Intrinsic	**Pulsating**	Swell and shrink in radius, magnitude and spectrum with some defined, sometimes irregular, period.	*Cepheids* - short periods and very regular luminosity cycles. *Long period variables* - much less regular.
	Eruptive	Young objects that are between nebula and true star (protostars), flare stars, giants, and supergiants, and eruptive binaries.	*Wolf 359* is a nearby red dwarf flare star.
	Explosive	Includes supernovae, and stellar explosions which do not destroy the progenitor star.	*SN 1987A*
Extrinsic	**Rotating**	Variance in luminosity due to rotating stars with sizable sunspots, bright poles of magnetic stars, and ellipsoidal stars.	*The Sun*
	Eclipsing	Vary in luminosity as stars eclipse one another.	*Sirius* (double), *Polaris* (triple), *Algol* (triple)

Clusters – A large number of stars bound by gravitational attraction.

	Description	*Notes*
Open Clusters *Pleides* in Taurus, many Messier objects	Up to a few thousand younger stars formed from the same *giant molecular cloud*.	More than 1,100 have been found in the Milky Way.
Globular Clusters *M13* in Hercules, many Messier objects	A spherical collection of up to hundreds of millions of old stars orbiting a galactic core.	About 150 known in the Milky Way. Every large galaxy has them.

Nebulae – Interstellar clouds of gas and dust.

	Description	*Notes*
Absorption	Absorb or scatter light.	*Horsehead* plate 293
Reflection	Illuminated by nearby stars.	*Pleiades* plate 242
Emission	Fluorescence due to irradiation from nearby stars.	*Orion* plate 240
Planetary	Actually thin shells of gas around gently erupting stars.	*Ring Nebula* plate 251
Supernova Remnants	Remains of supernova explosion.	*Crab Nebula* plate 212

V838 Mon red variable star in Monoceros