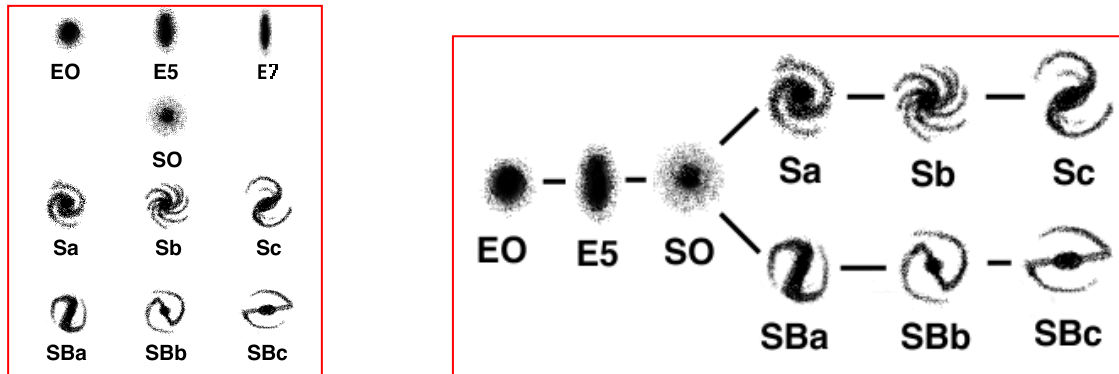




East Sussex Astronomical Society

Hubble's Classification Scheme

Edwin Hubble developed a galaxy classification scheme consisting of four types: elliptical, spiral, barred spiral, and irregular. Three of these types are represented in the two diagrams below. Note the Hubble tuning fork diagram (on the right) does not represent time evolution.



Elliptical Galaxies: Elliptical galaxies shows no spiral structure and can vary from almost round (called E0) to cigar shaped (called E7). Classification based on our perspective from Earth (not on the actual shape). Populated by old stars.

Spiral Galaxies: These galaxies have outstretched, curving arms suggestive of a whirlpool or pinwheel. Hubble distinguished different sub-classes according to the tightness of the arms and the size of the nucleus. In terms of the arms, Sa is the tightest wound while Sc is the most open. In terms of the nucleus, Sa has the largest while Sc has the smallest. Free hydrogen so new stars being born.

Barred Spirals: These show the same spiral structure as normal spiral galaxies but have a prominent bar through their nucleus. The sub-classifications are the same as for normal spirals. Free hydrogen so new stars being born.

Lenticular Galaxies: The galaxies that appear to have a disc structure like spiral galaxies but no visible arms. They are called S0.

Irregular Galaxies: Certain galaxies lack either an obvious spiral structure or nuclear bulge, appearing instead as a random collection of stars with no obvious order. They show lack of symmetry. Irregular galaxies have much free hydrogen gas and thus have prolific star formation.

Galaxy Property	Elliptical	Spiral	Irregular
Ratio of galaxies	~ 60%	~ 30%	<15%
Ratio of mass of hydrogen to mass of stars	~ 1%	~ 10%	~ 20%
Star populations (Pop II- old; Pop I - young)	Pop II	Pop I & II	Pop I & II
Mass range (number of solar masses)	$10^5 \sim 10^{13}$	$10^9 \sim 10^{12}$	$10^7 \sim 10^{10}$
Diameter (compared with the Milky Way)	0.01 ~ 5	0.02 ~ 1.5	0.05 ~ 0.25