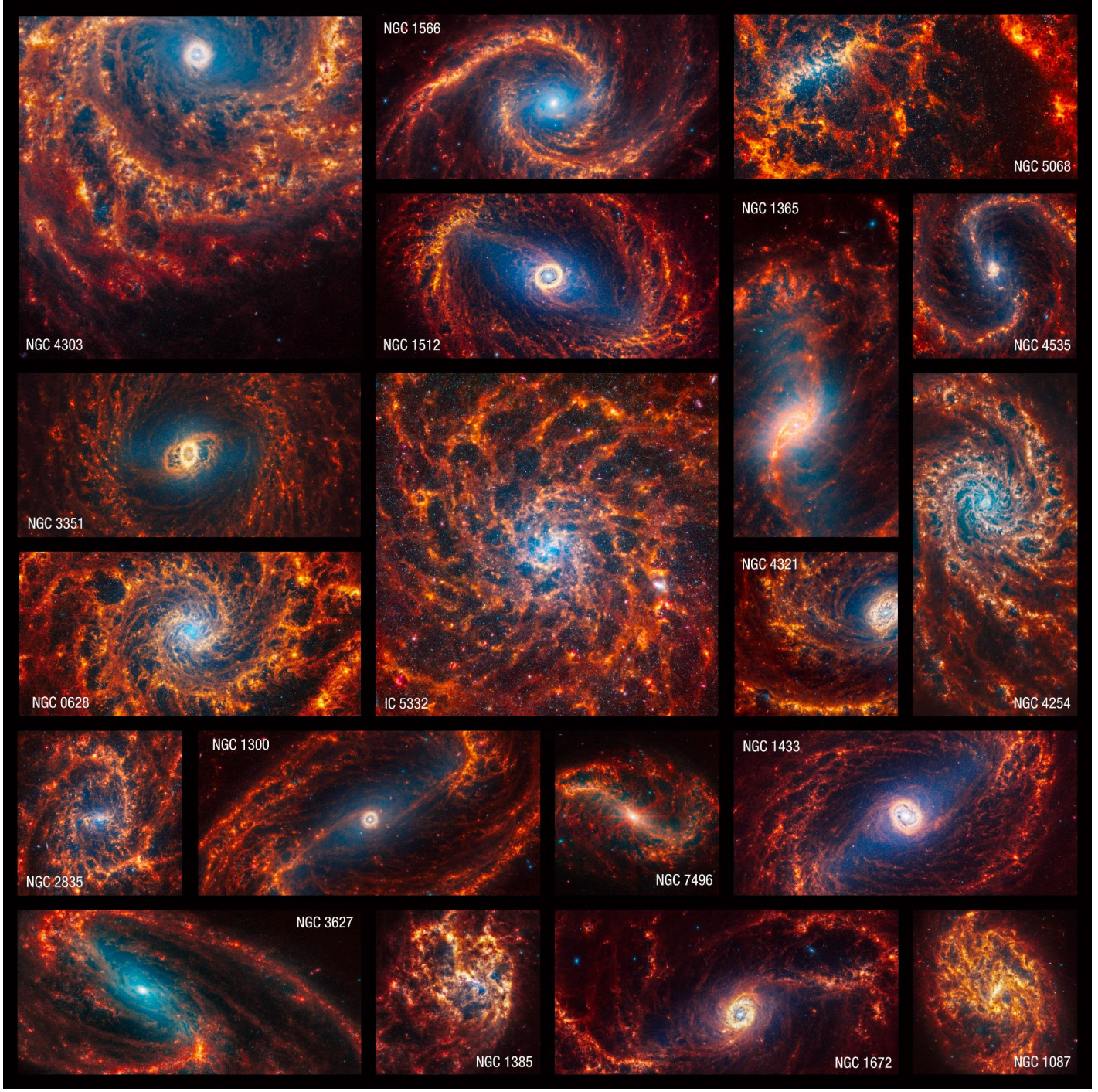
ASTR368
Galaxies!
(Chapter 25)


NGC 4303
NGC 1566
NGC 5068
NGC 1512
NGC 1365
NGC 4535
NGC 3351
NGC 0628
IC 5332
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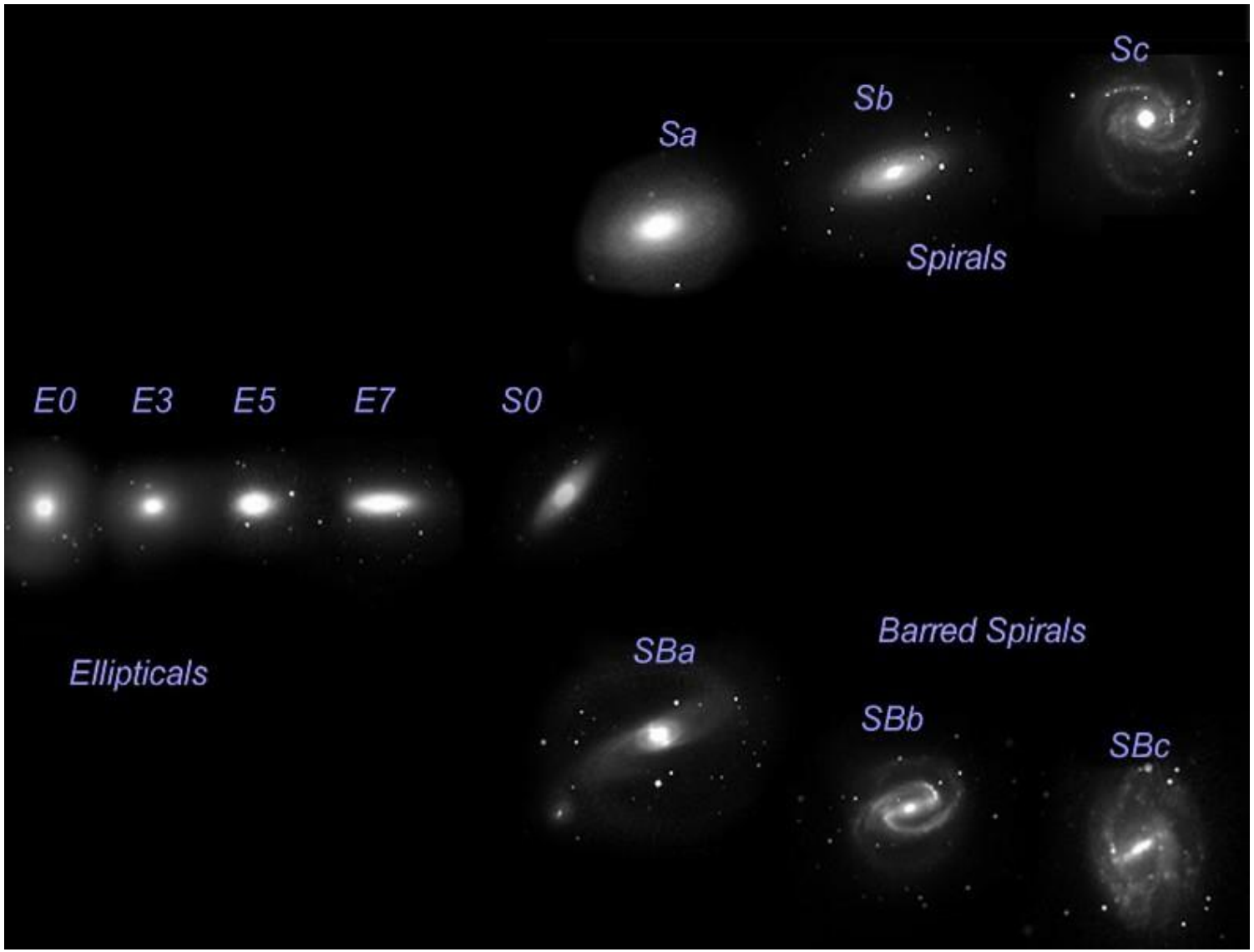
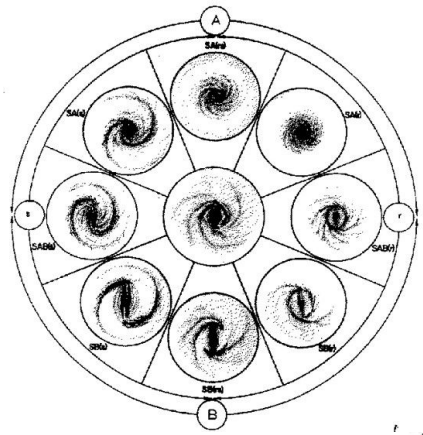
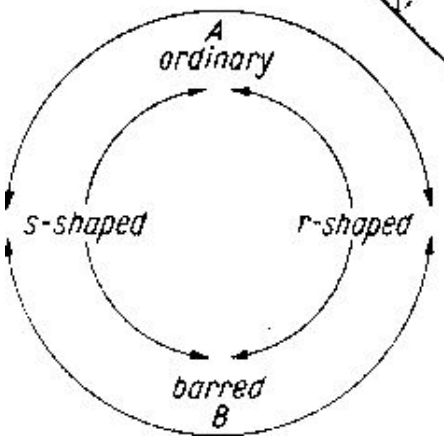
NGC 2835
NGC 1300
NGC 7496
NGC 1433
NGC 3627
NGC 1385
NGC 1672
NGC 1087

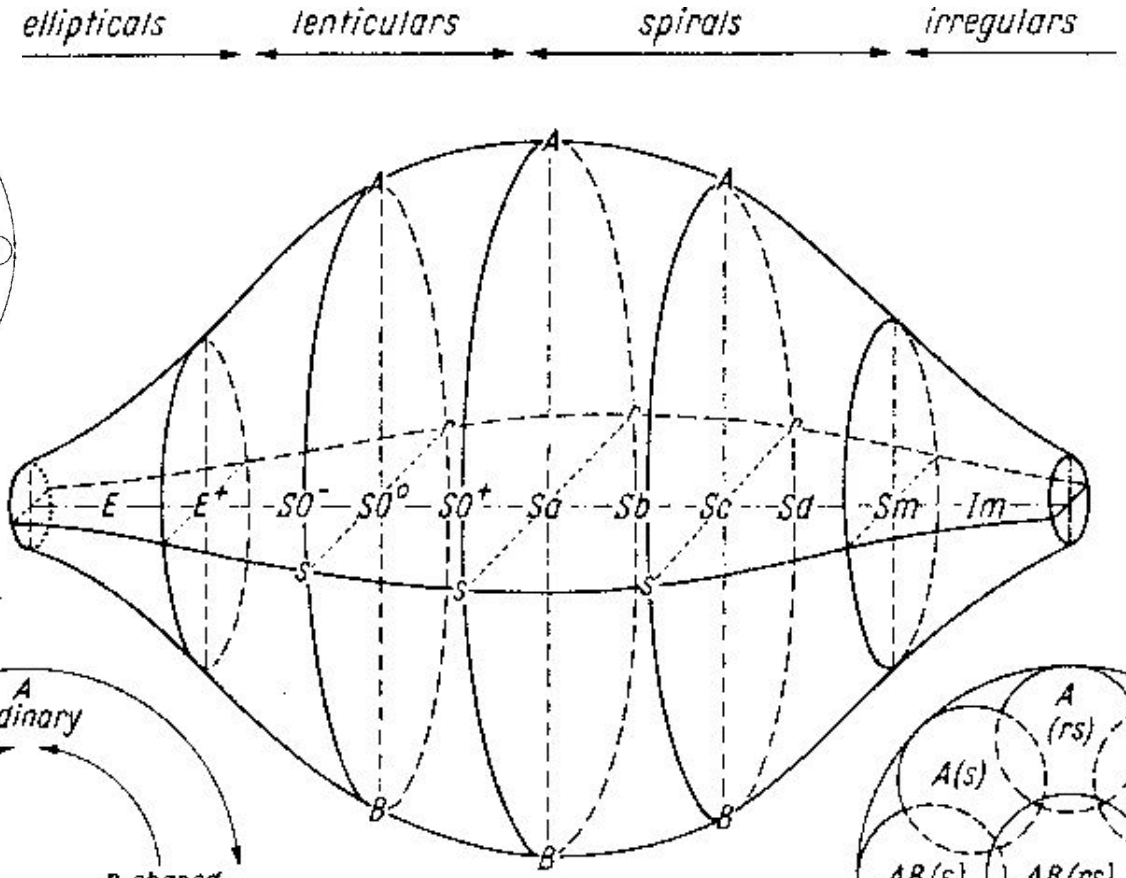
Hubble's Tuning Fork

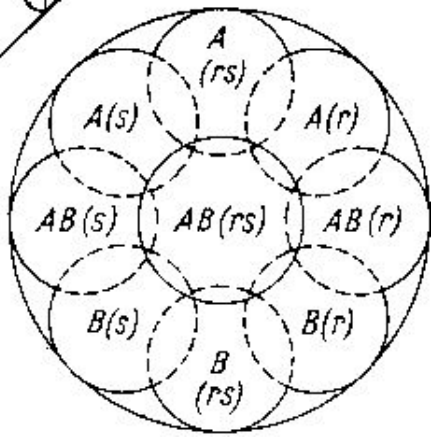


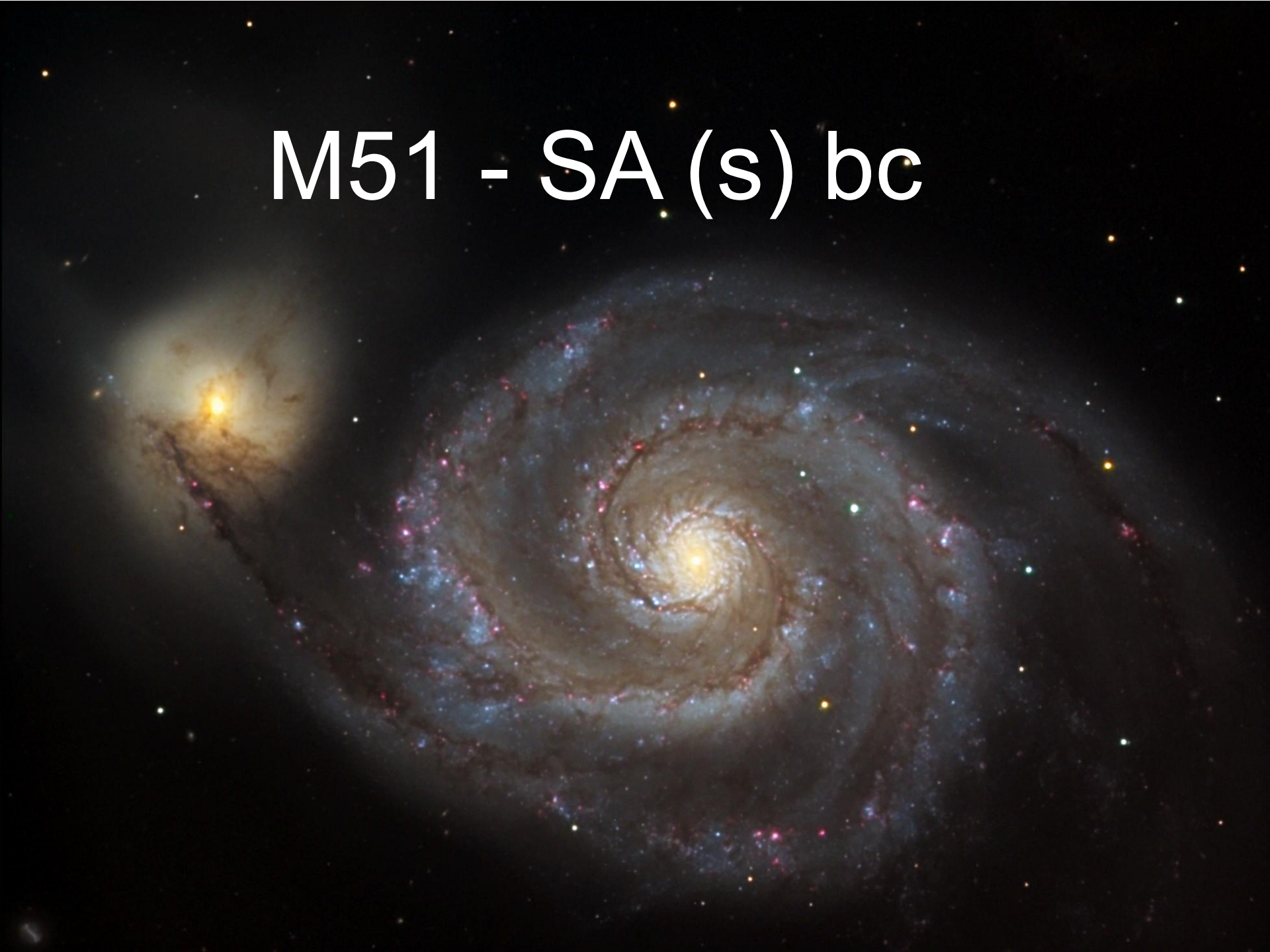
deVancouleur's Thing










M51 - SA (s) bc

NGC1300 - SB(s)bc

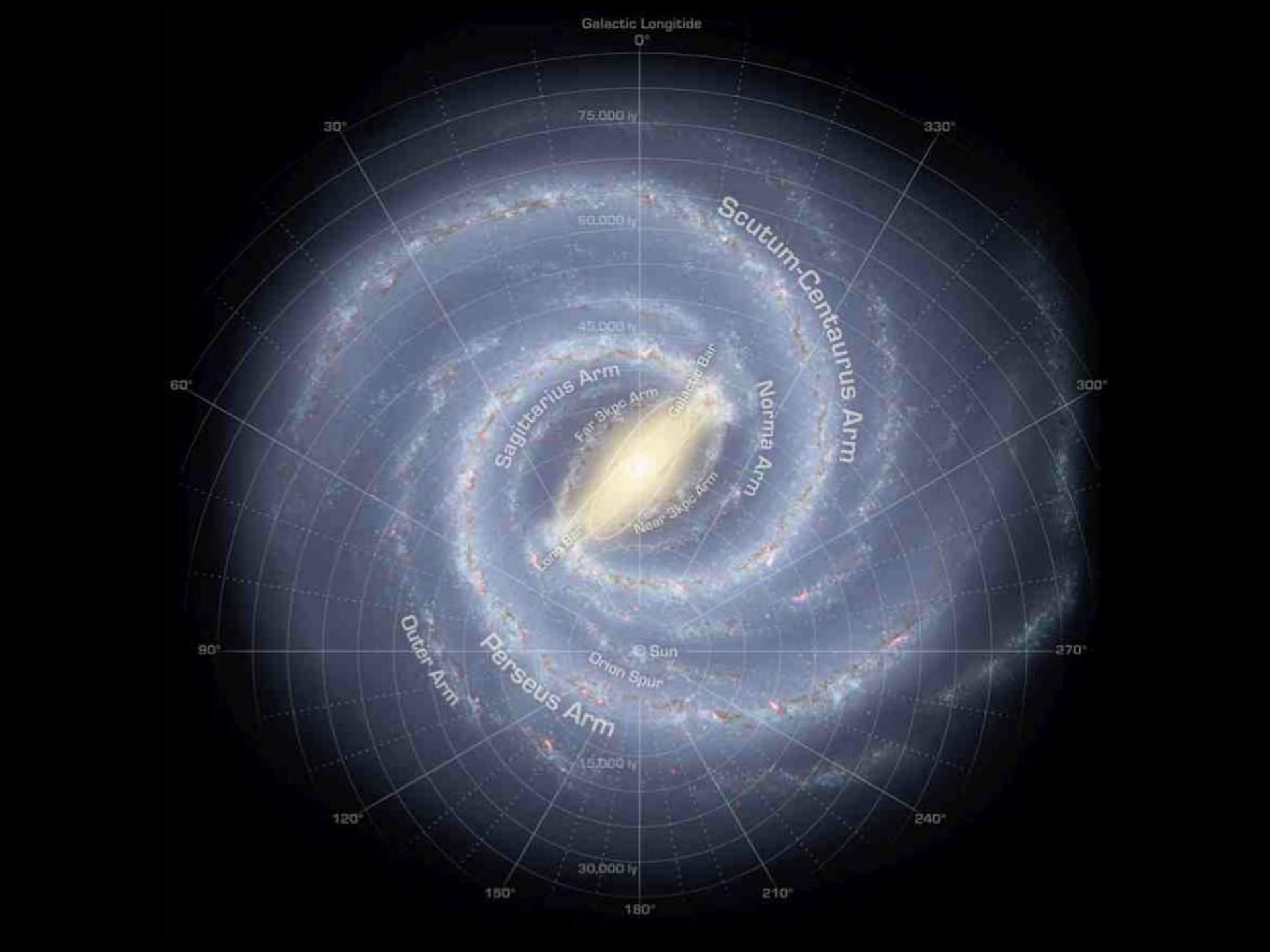

Ringed

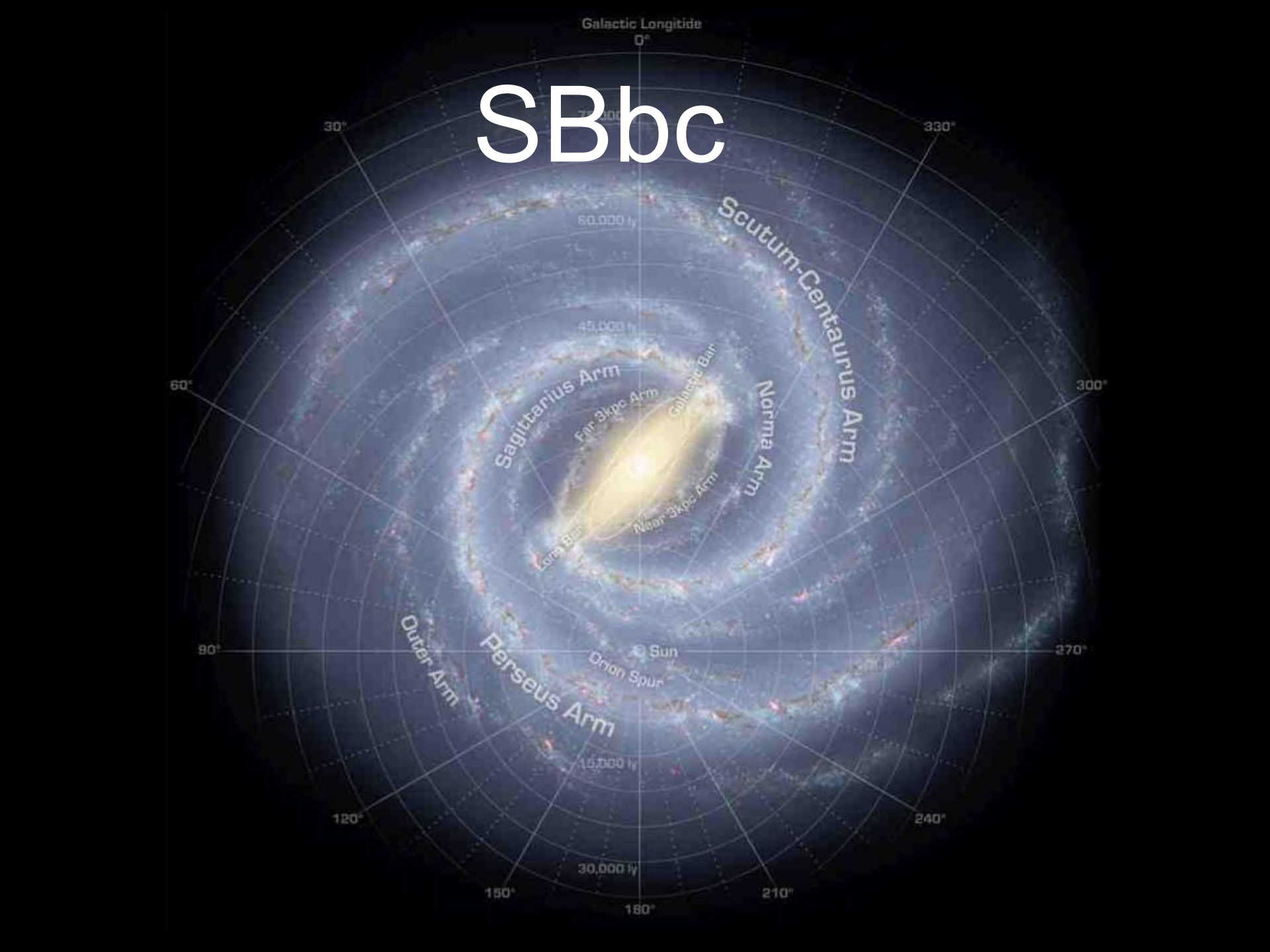

Irr

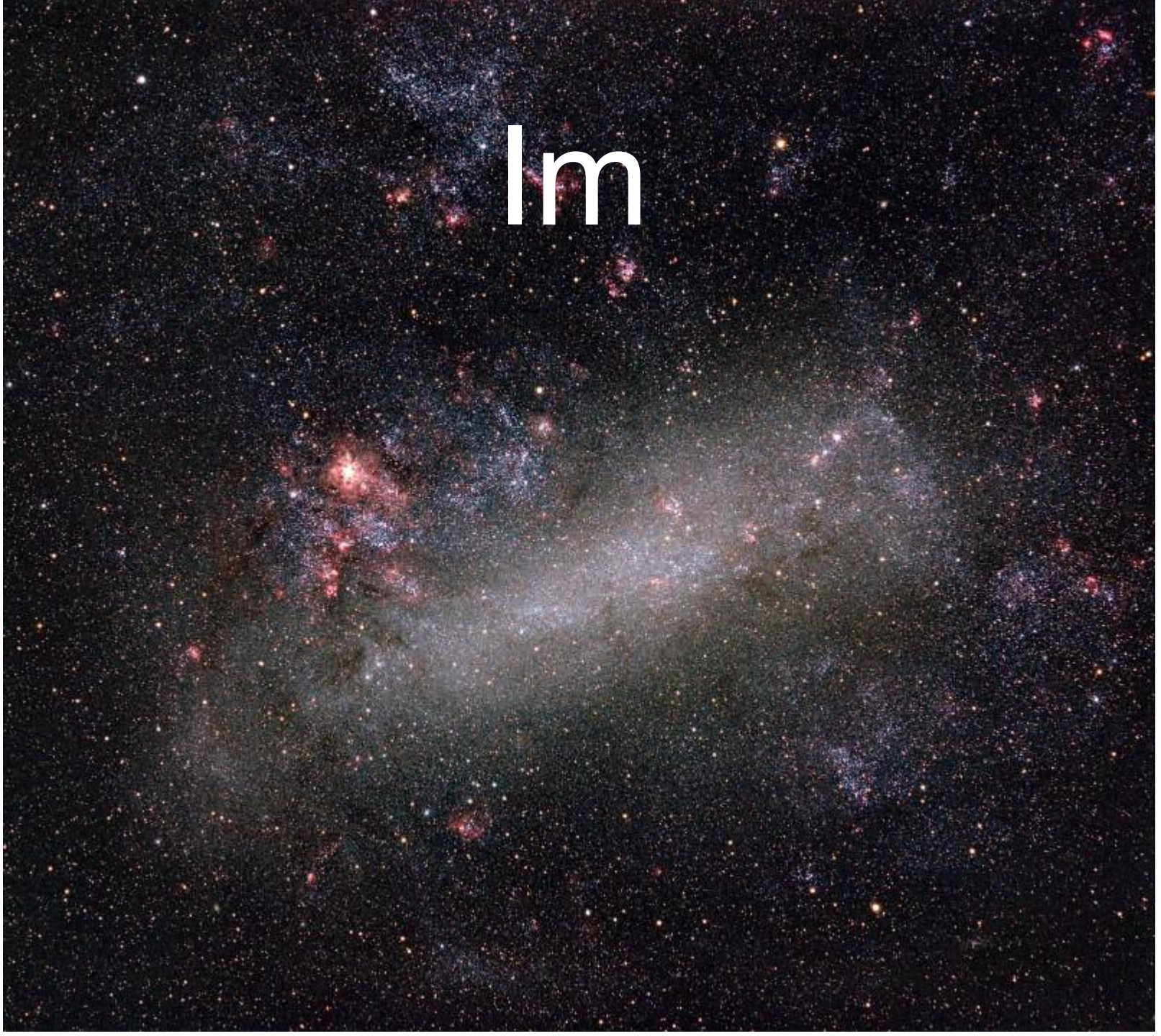
NGC 2787 - S0 (lenticular)


M101 - SAB(rs)cd

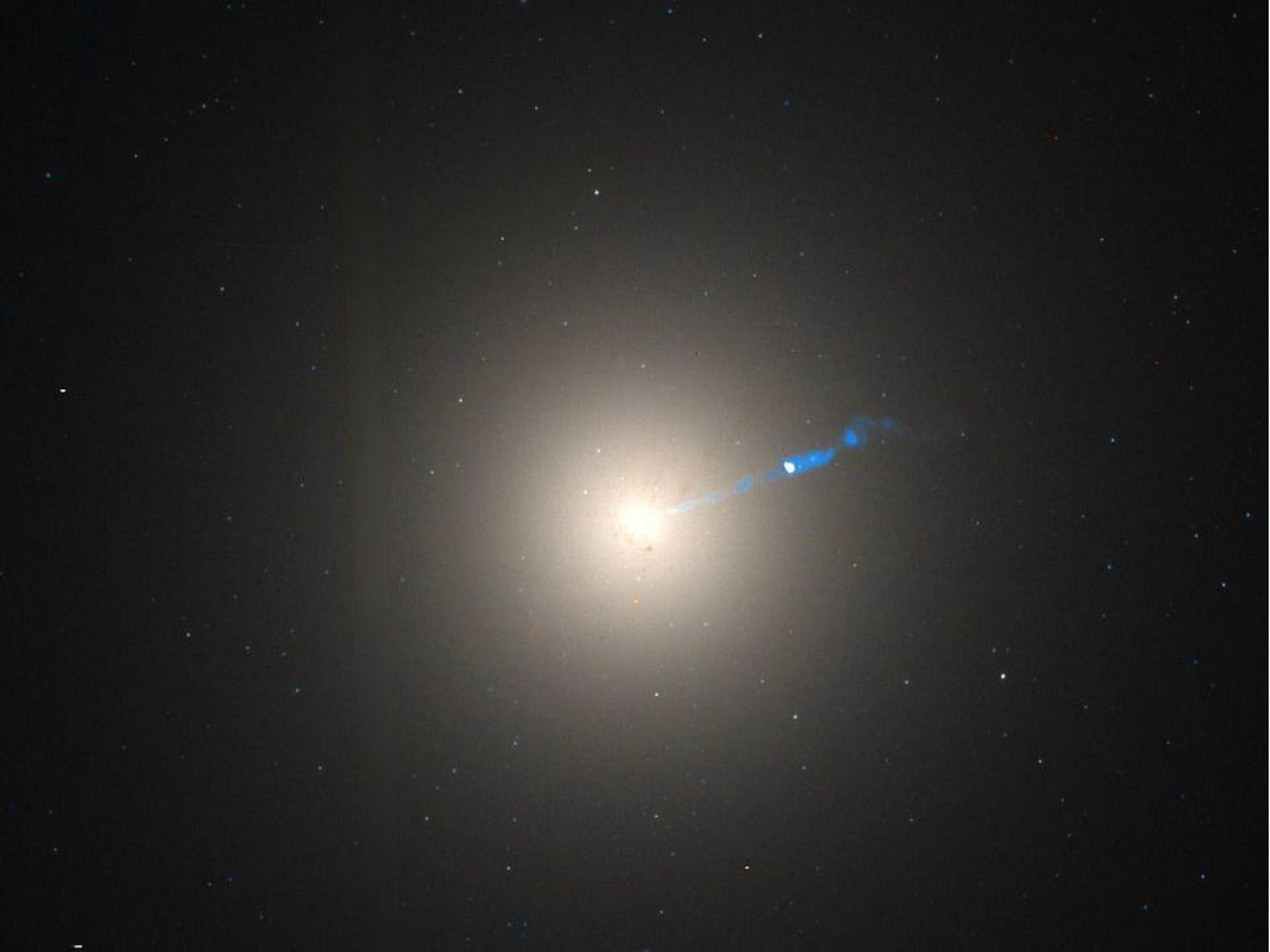

M104 - SA(s)a

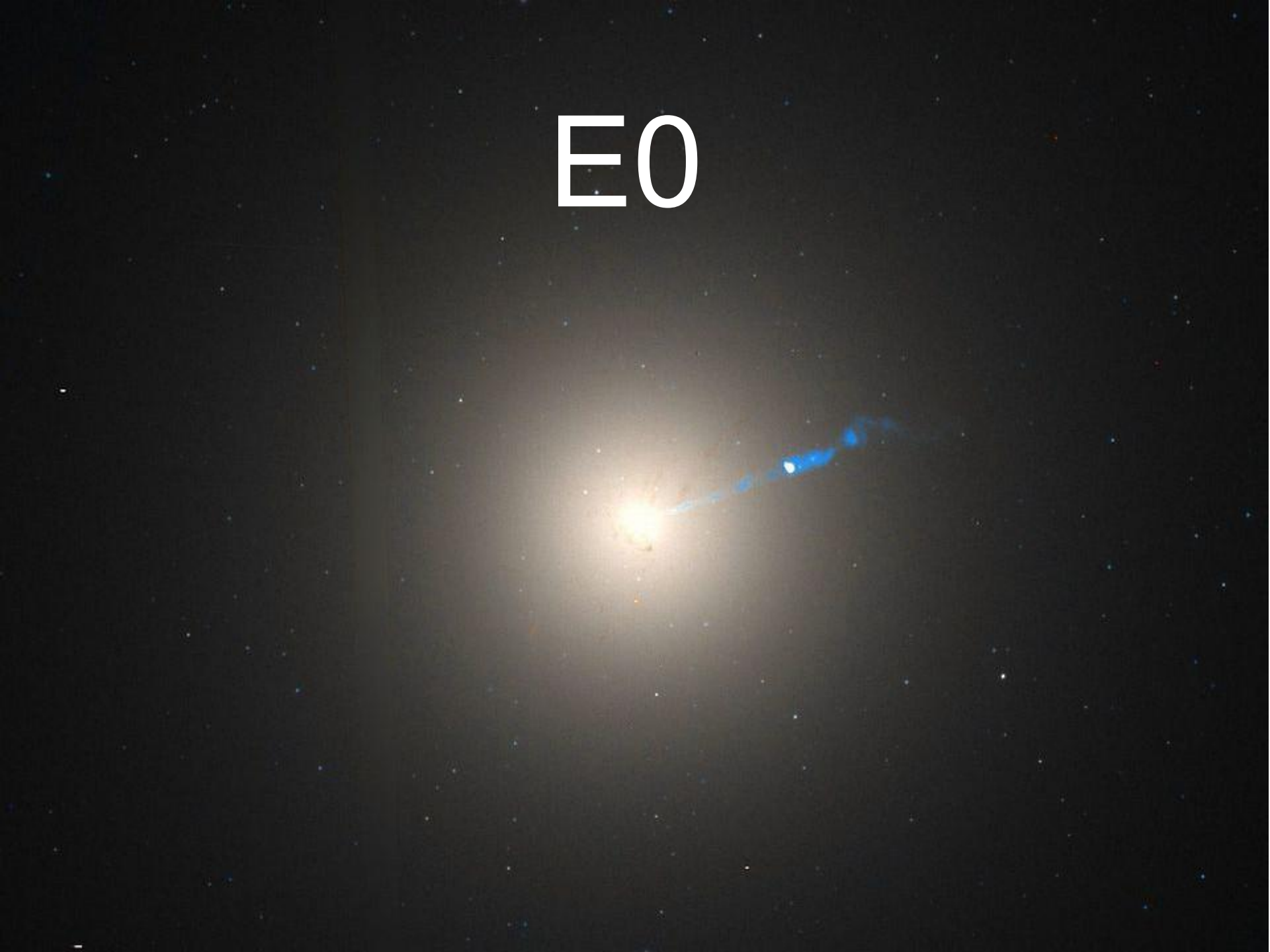

Galactic Longitide
0°
30°
330°
60°
300°
90°
270°
120°
240°
150°
210°
180°
75,000 ly
60,000 ly
45,000 ly
30,000 ly
15,000 ly
Scutum-Centaurus Arm
Sagittarius Arm
Norma Arm
Perseus Arm
Outer Arm
Far 3kpc Arm
Near 3kpc Arm
Galactic Bar
Sun
Orion Spur

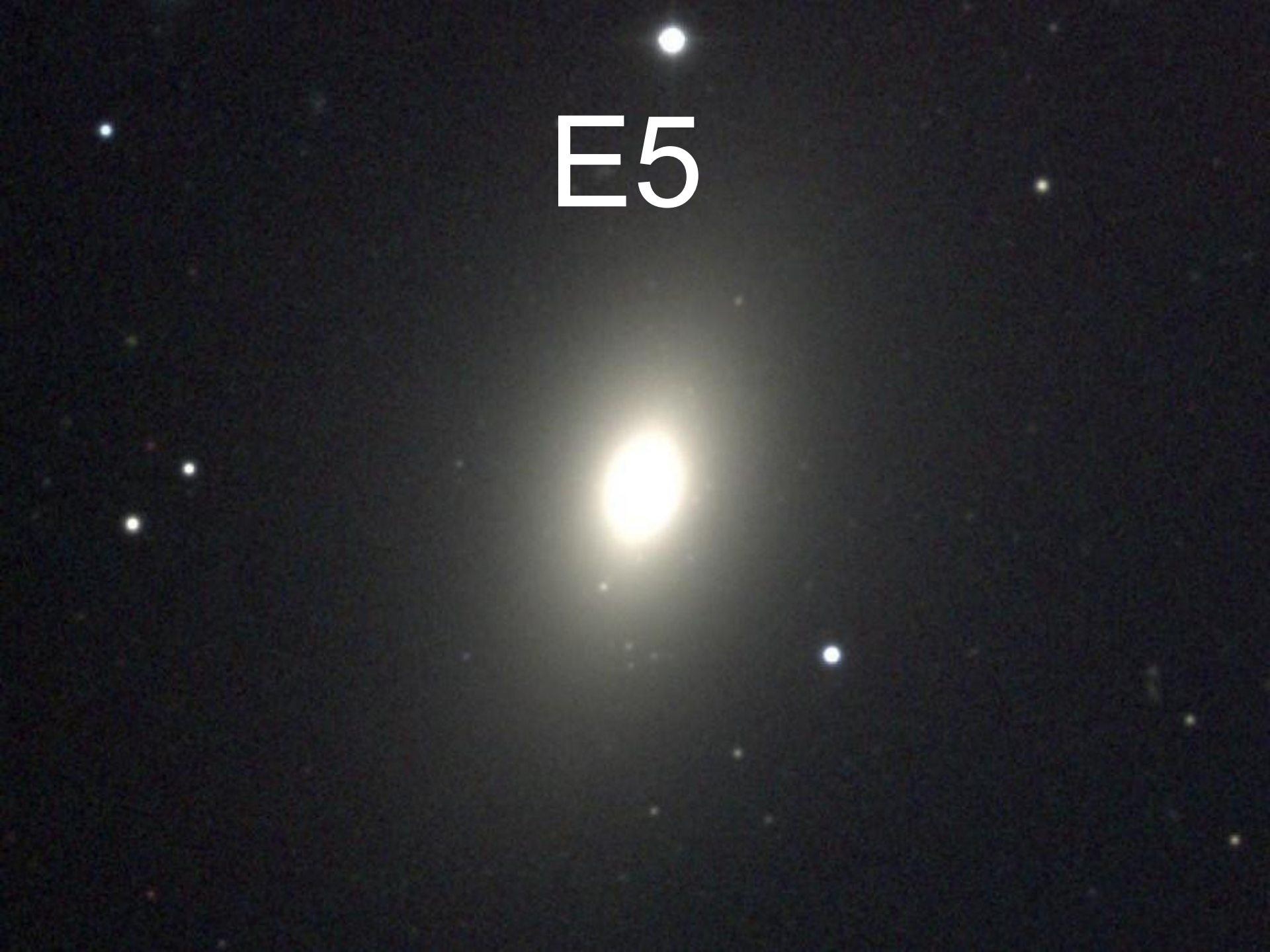

SBbc
Galactic Longitide
0°
30°
330°
60°
300°
90°
270°
120°
240°
150°
210°
180°
60,000 ly
45,000 ly
30,000 ly
15,000 ly
Scutum-Centaurus Arm
Sagittarius Arm
Norma Arm
Perseus Arm
Outer Arm
Far 3kpc Arm
Near 3kpc Arm
Galactic Bar
Sun
Orion Spur


Im

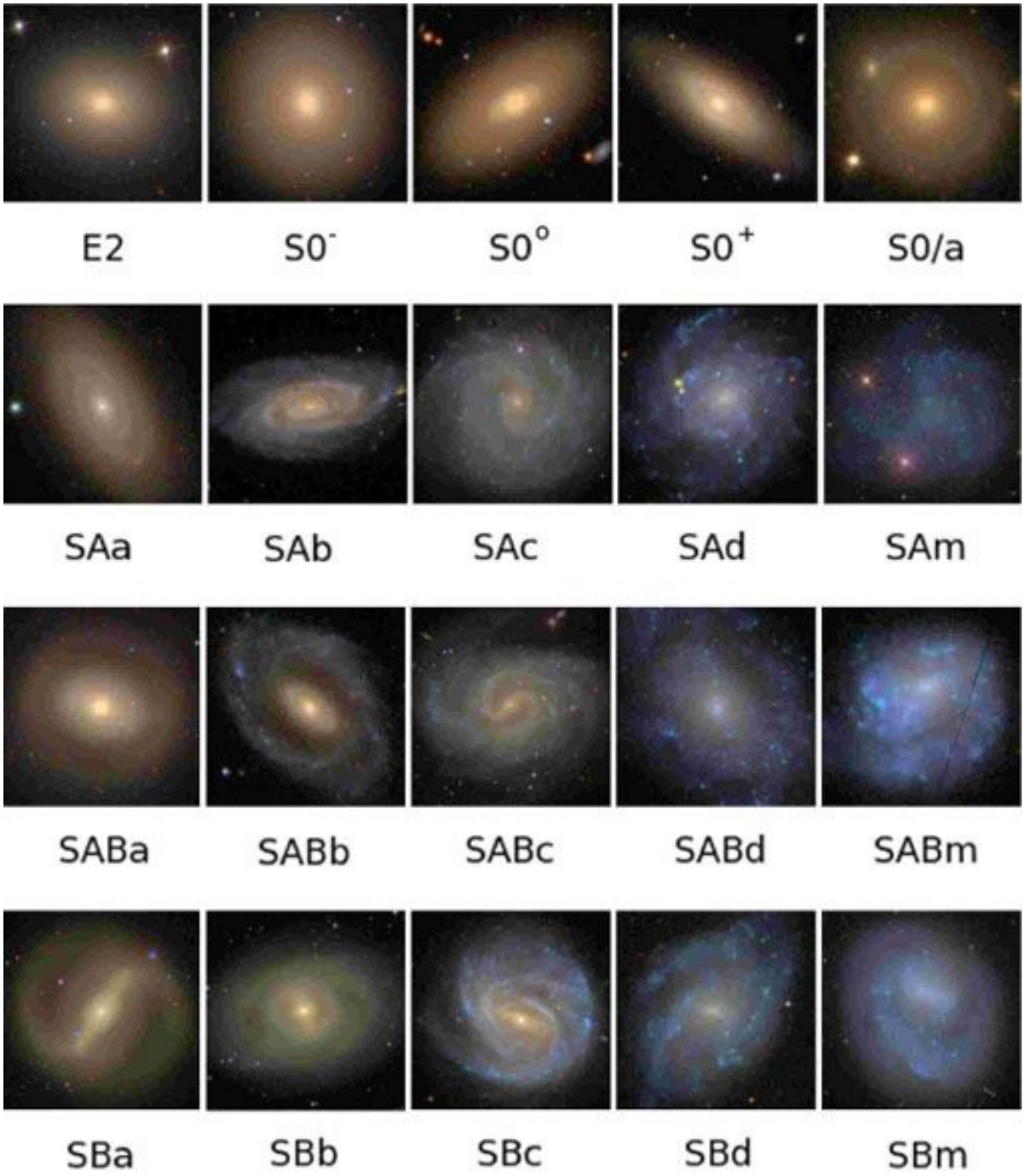

Irr

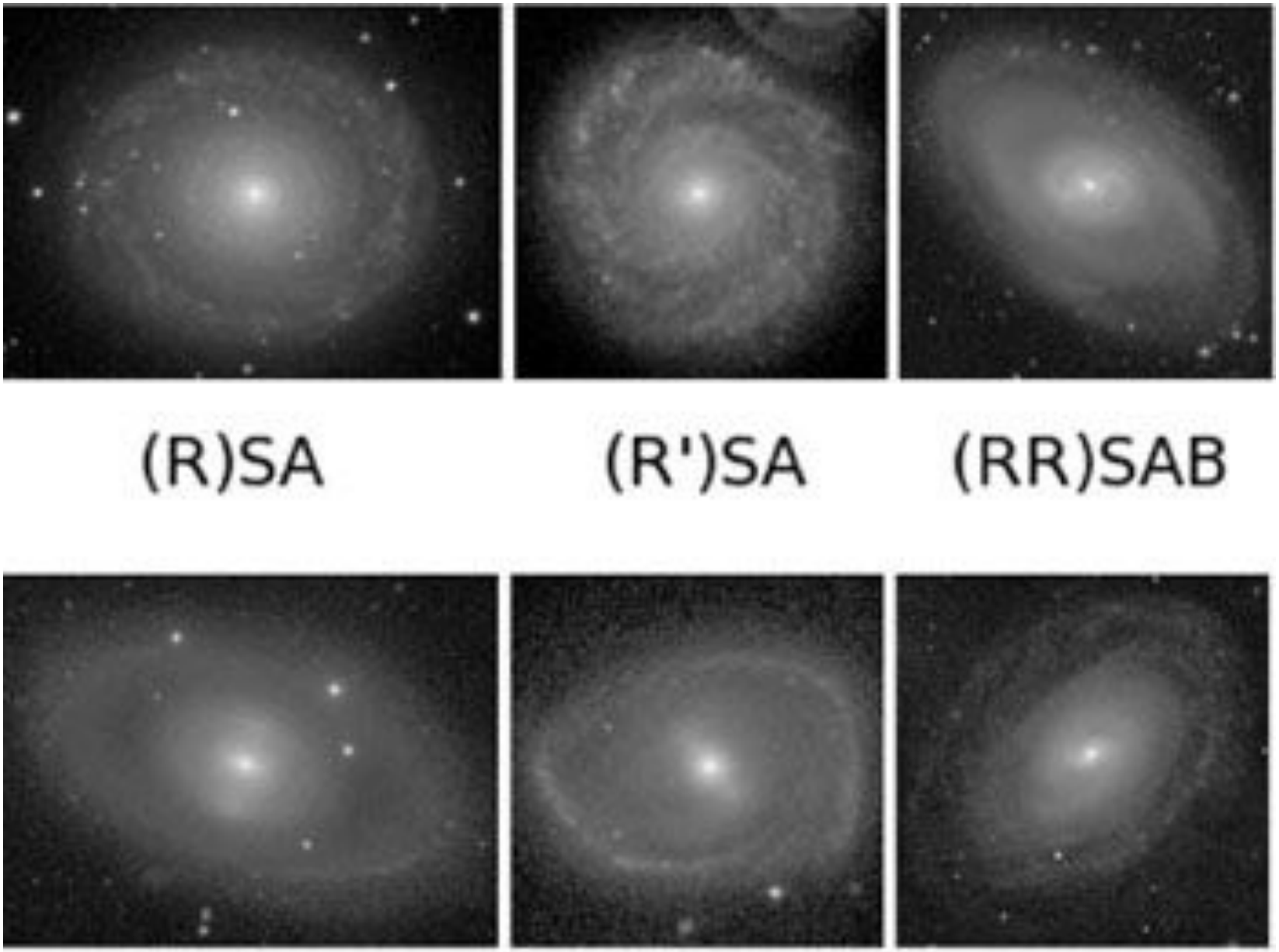


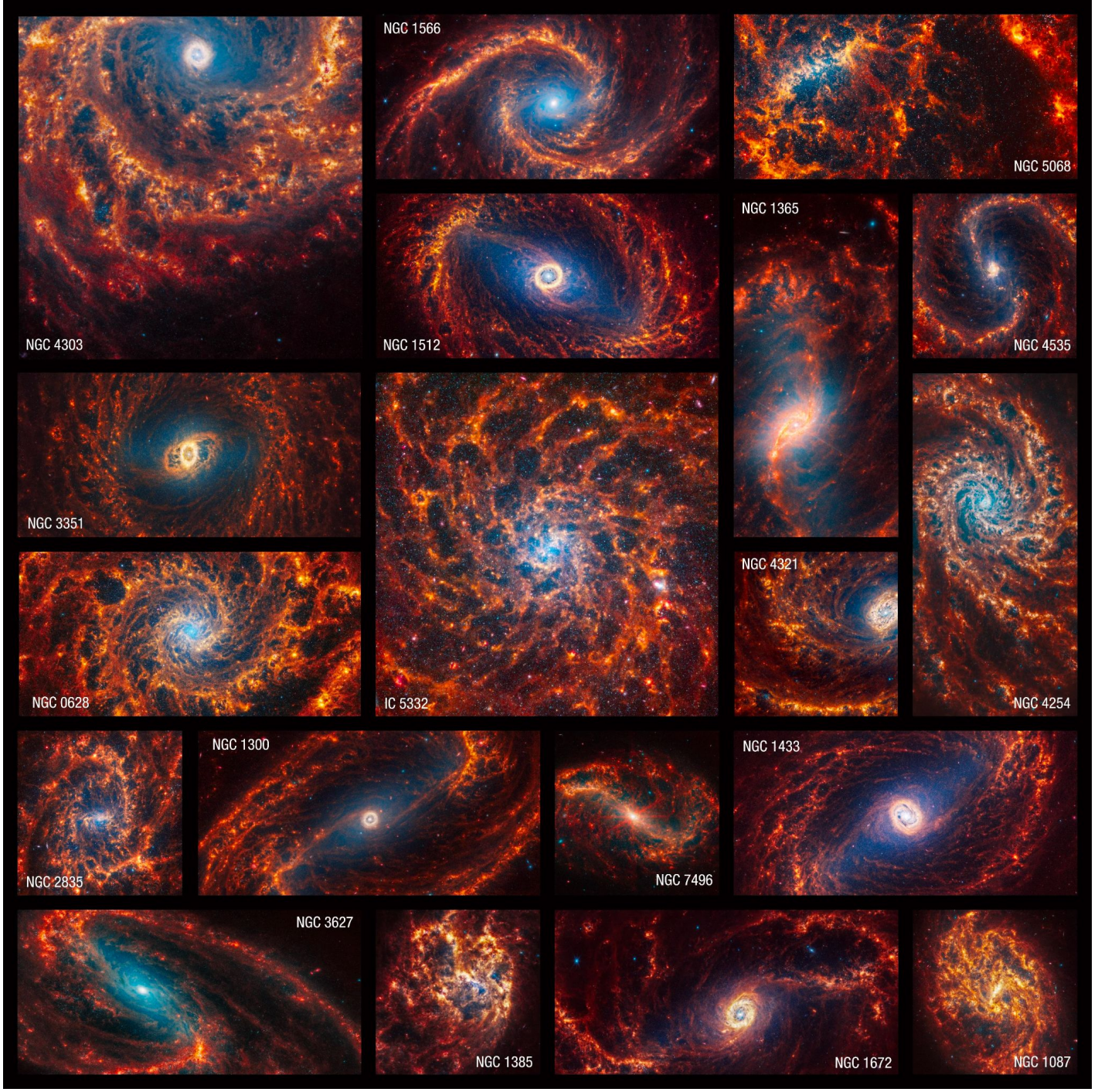

E0


E5


dE


E2
S0⁻
S0°
S0⁺
S0/a
SAa
SAb
SAc
SAd
SAm
SABa
SABb
SABc
SABd
SABm
SBa
SBb
SBc
SBd
SBm


(R)SA
(R')SA
(RR)SAB
(R)SB
(R')SB
(R')SAB


NGC 4303
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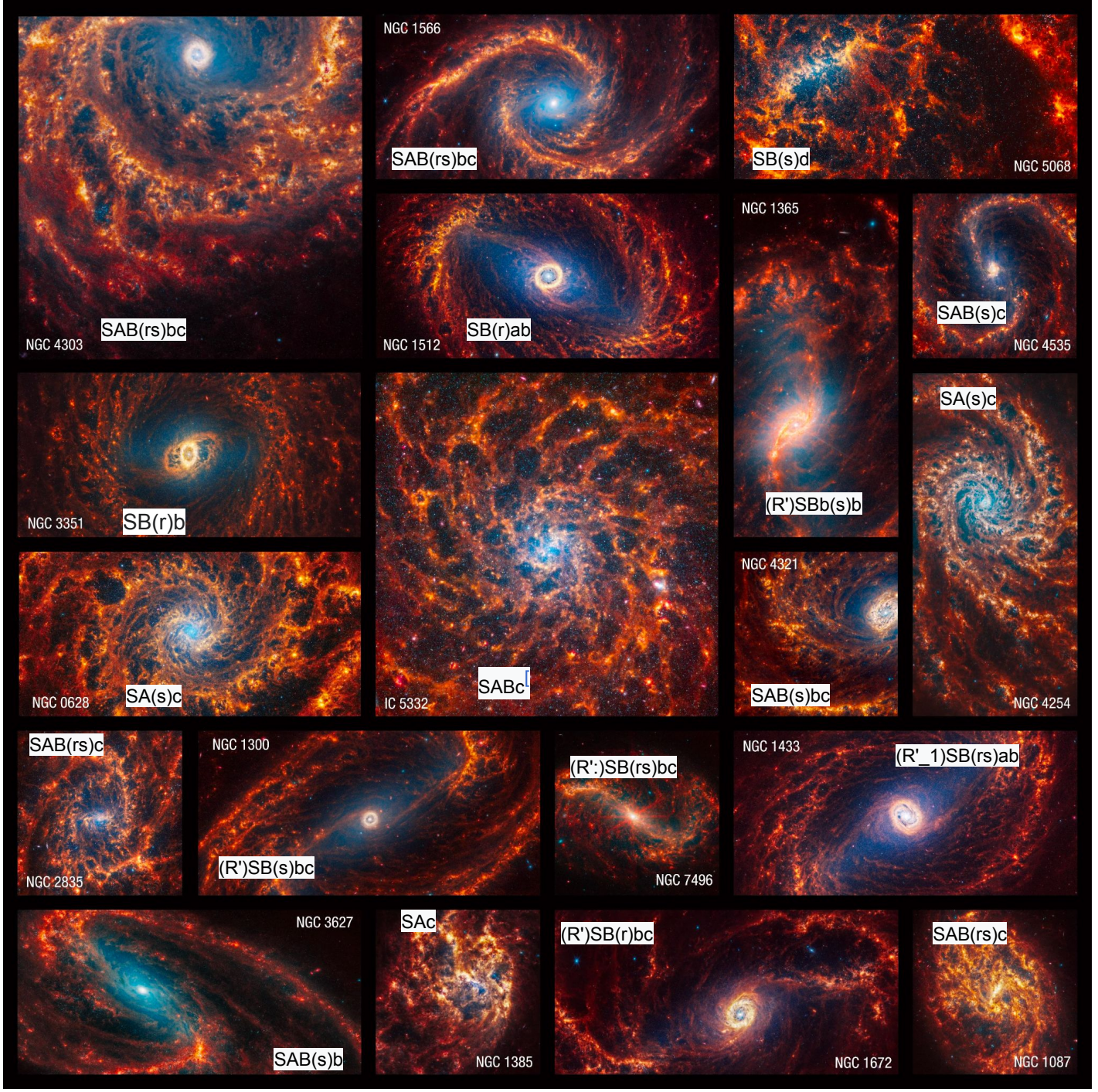
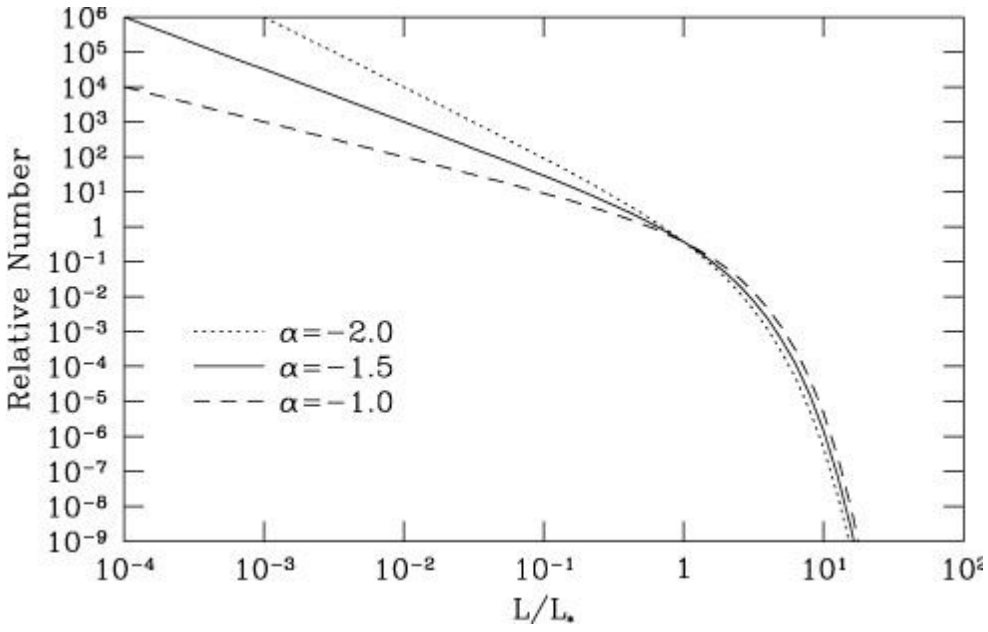
NGC 7496
NGC 1433
NGC 3627
NGC 1385
NGC 1672
NGC 1087


NGC 4303
SAB(rs)bc
NGC 1566
SAB(rs)bc
SB(s)d
NGC 5068
NGC 1512
SB(r)ab
NGC 1365
(R')SBb(s)b
SAB(s)c
NGC 4535
NGC 3351
SB(r)b
IC 5332
SABc
SA(s)c
NGC 4254
NGC 0628
SA(s)c
NGC 4321
SAB(s)bc
SAB(rs)c
NGC 2835
NGC 1300
(R')SB(s)bc
(R':)SB(rs)bc
NGC 7496
NGC 1433
(R'_1)SB(rs)ab
NGC 3627
SAB(s)b
SAc
NGC 1385
(R')SB(r)bc
NGC 1672
SAB(rs)c
NGC 1087



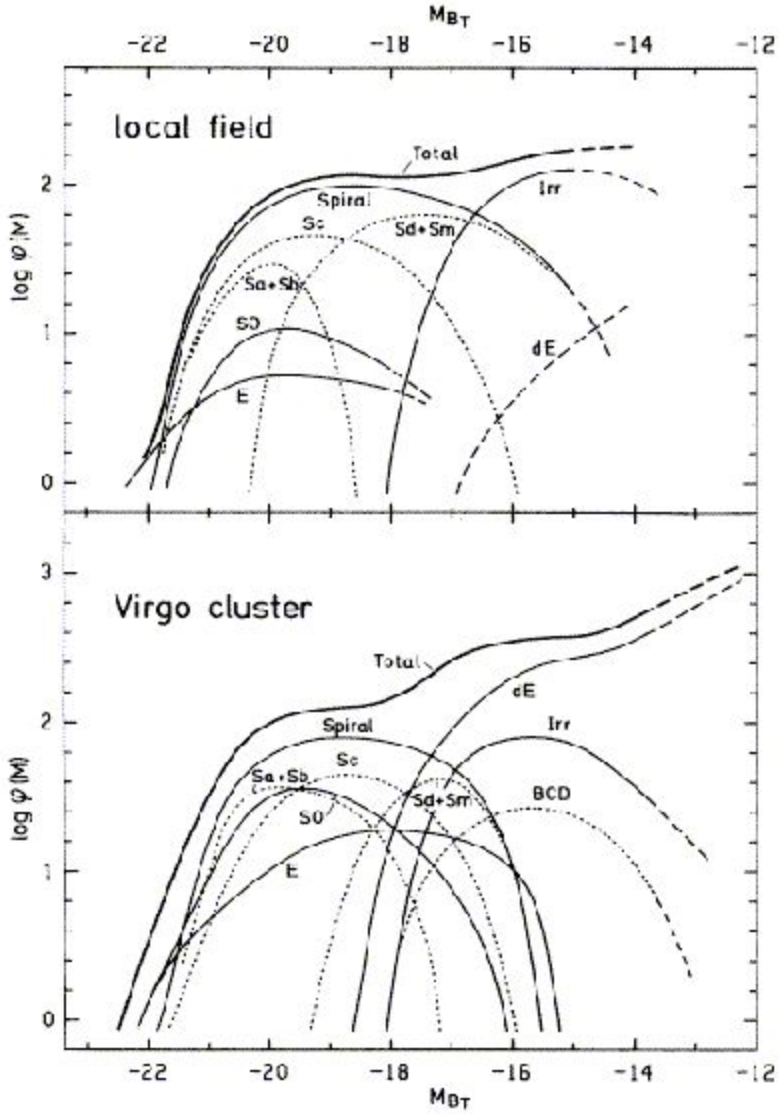


Figure 1 The LF of field galaxies (top) and Virgo cluster members (bottom). The zero point of $\log \varphi(M)$ is arbitrary. The LFs for individual galaxy types are shown. Extrapolations are marked by dashed lines. In addition to the LF of all spirals, the LFs of the subtypes Sa+Sb, Sc, and Sd+Sm are also shown as dotted curves. The LF of Irr galaxies comprises the Im and BCD galaxies. In the case of the Virgo cluster, the BCDs are also shown separately. The classes cS0 and "cE or Im" are not illustrated. They are, however, included in the total LF over all types (heavy line).

Light Distributions

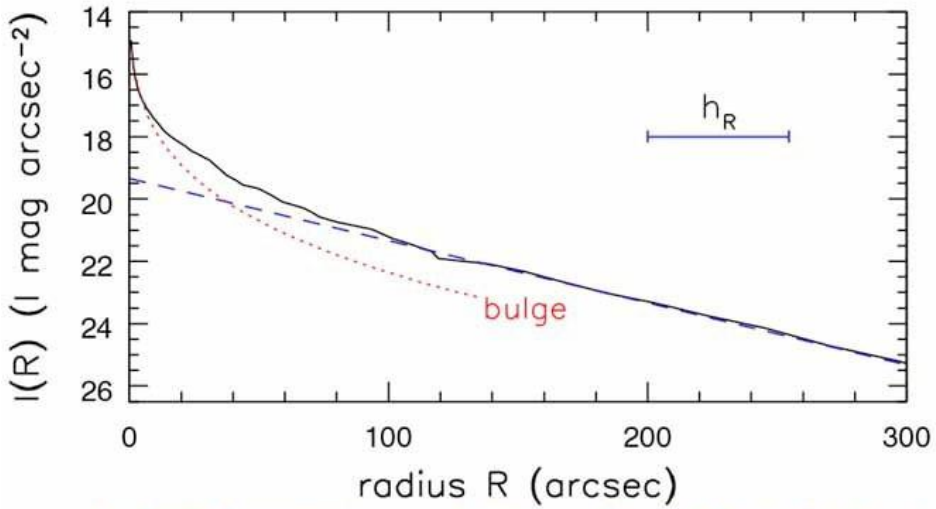
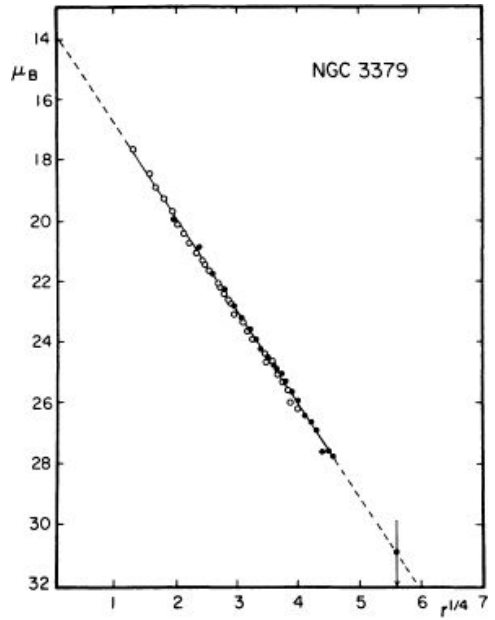


Fig 5.4 (R. Peletier) 'Galaxies in the Universe' Sparke/Gallagher CUP 2007



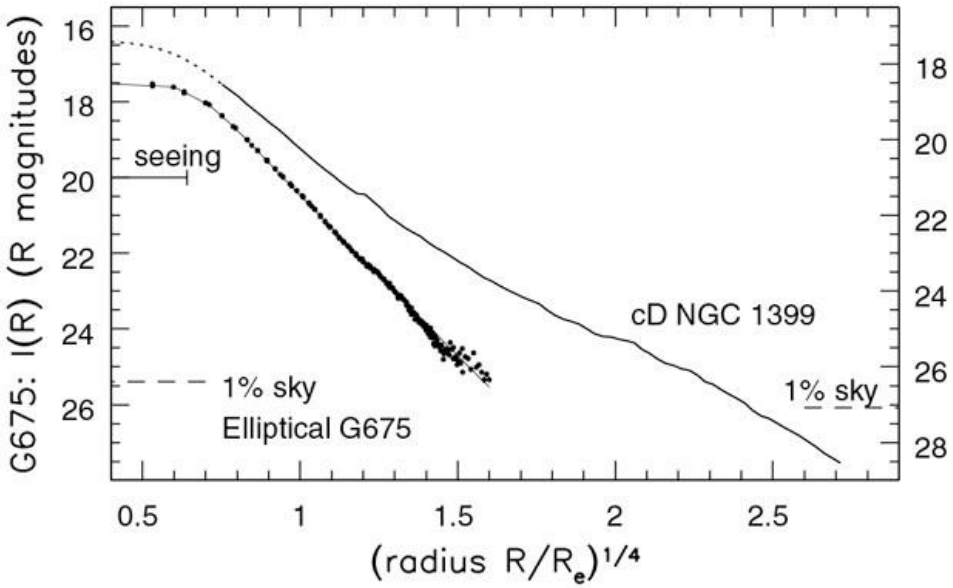


Fig 6.3 (Saglia, Caon) 'Galaxies in the Universe' Sparke/Gallagher CUP 2007

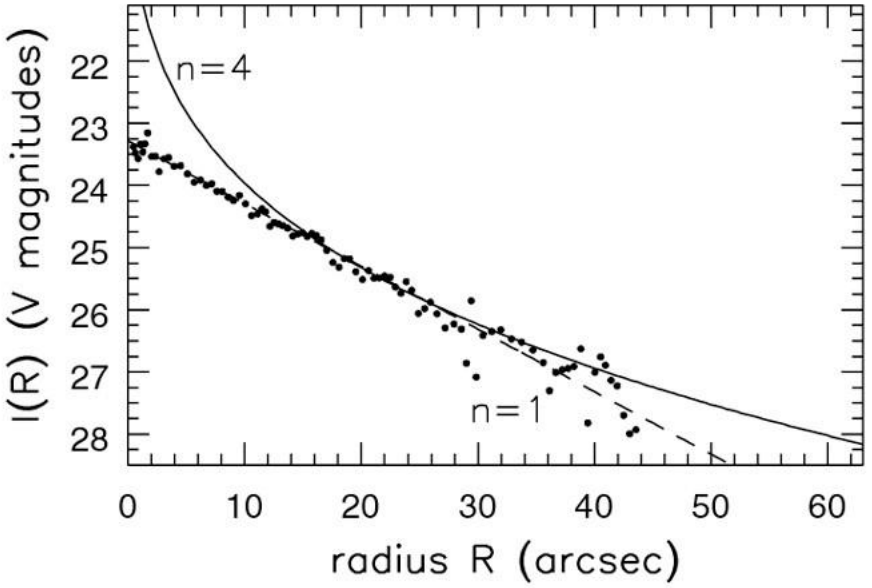
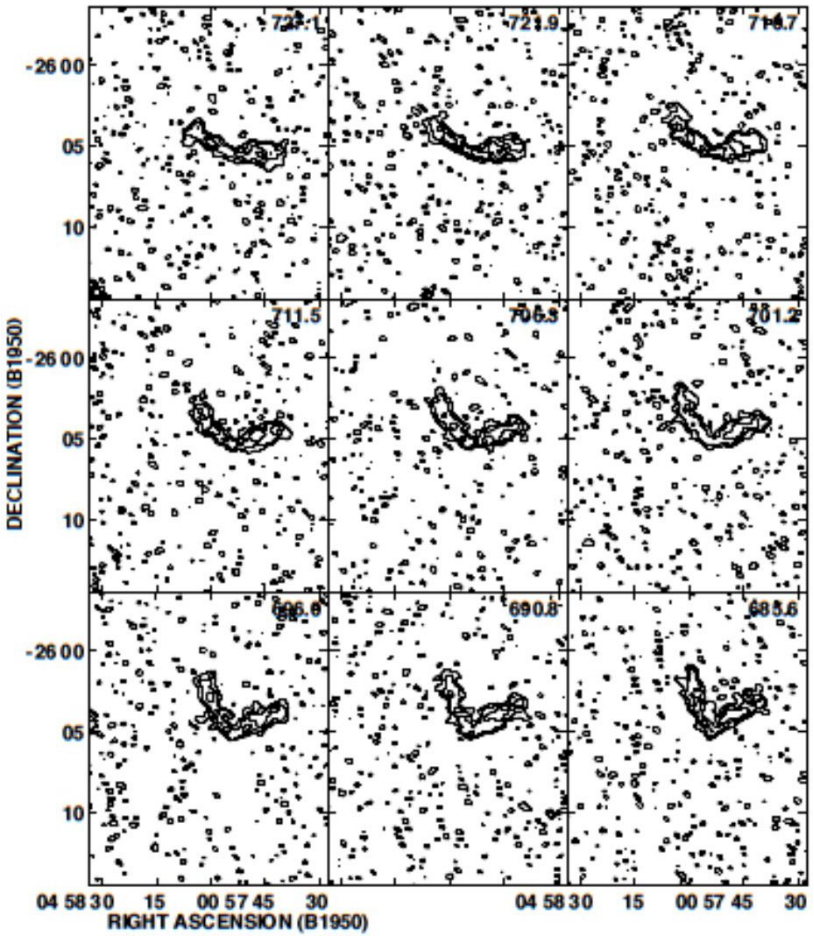
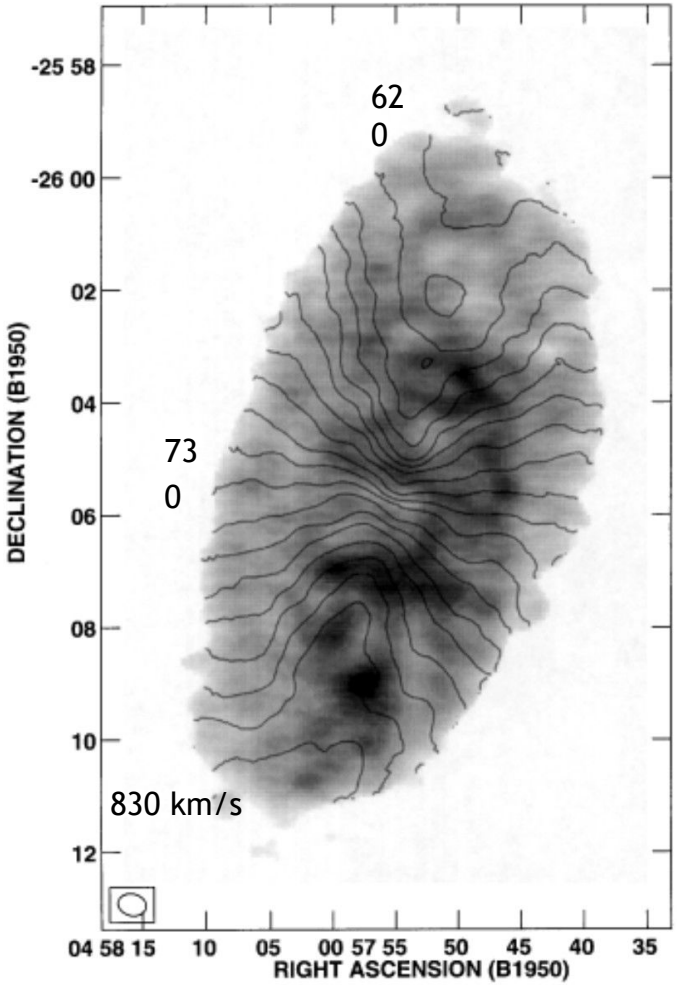


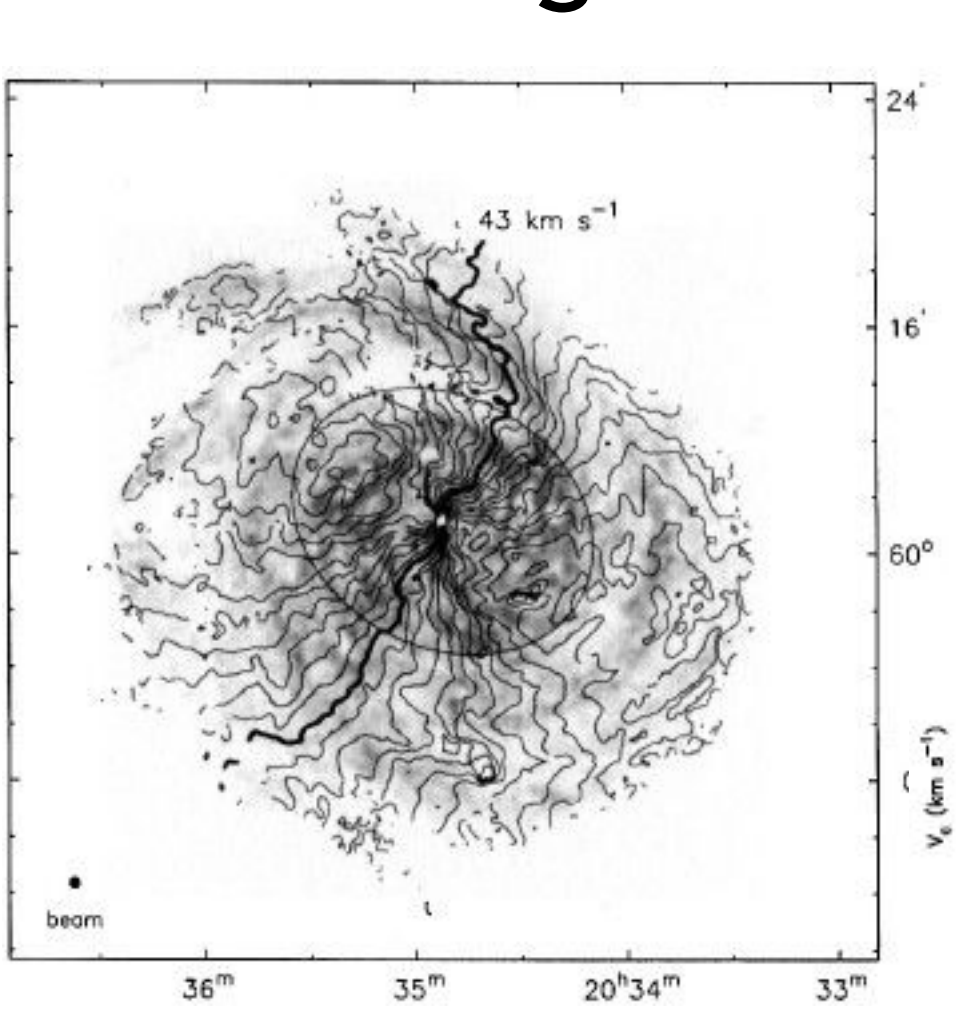
Fig 6.2 (H. Jerjen) 'Galaxies in the Universe' Sparke/Gallagher CUP 2007

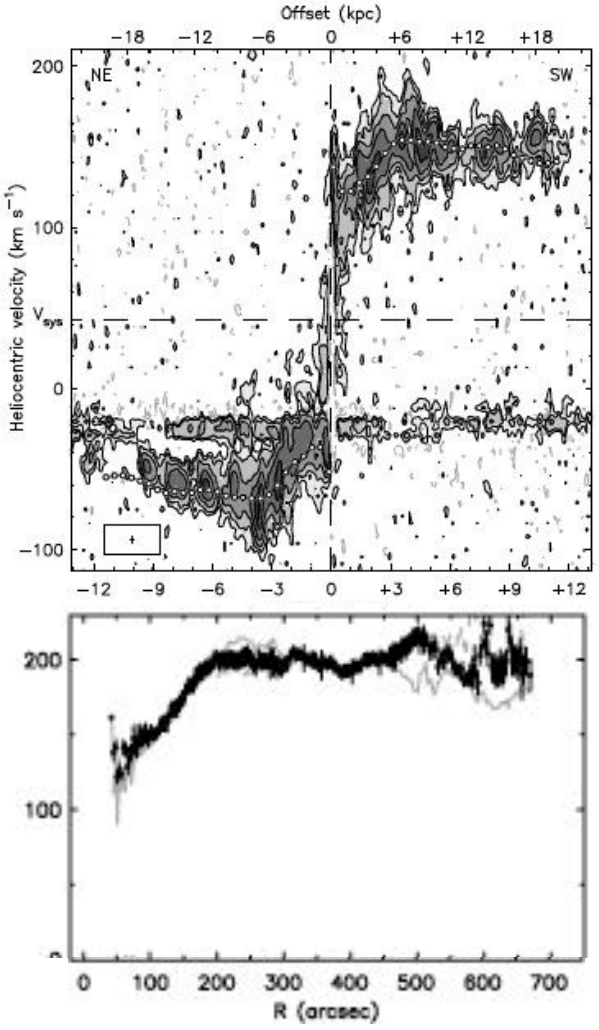
“Pure” Rotation



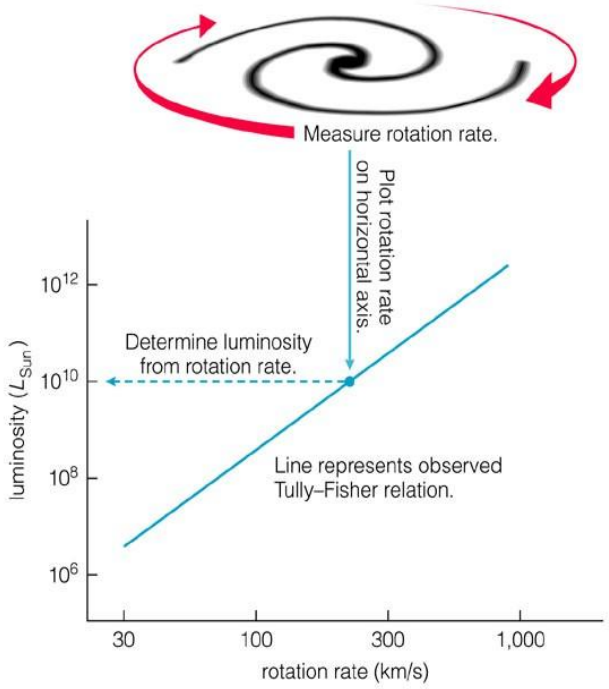


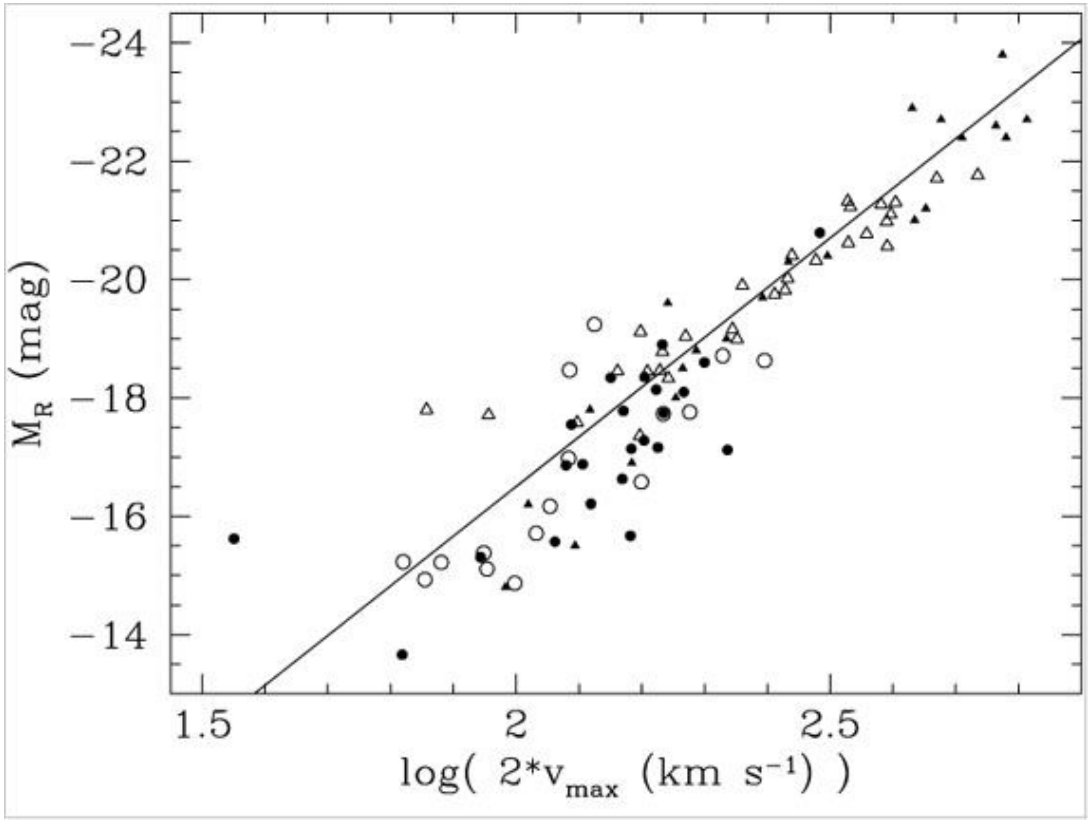
Extracting a Rotation Curve



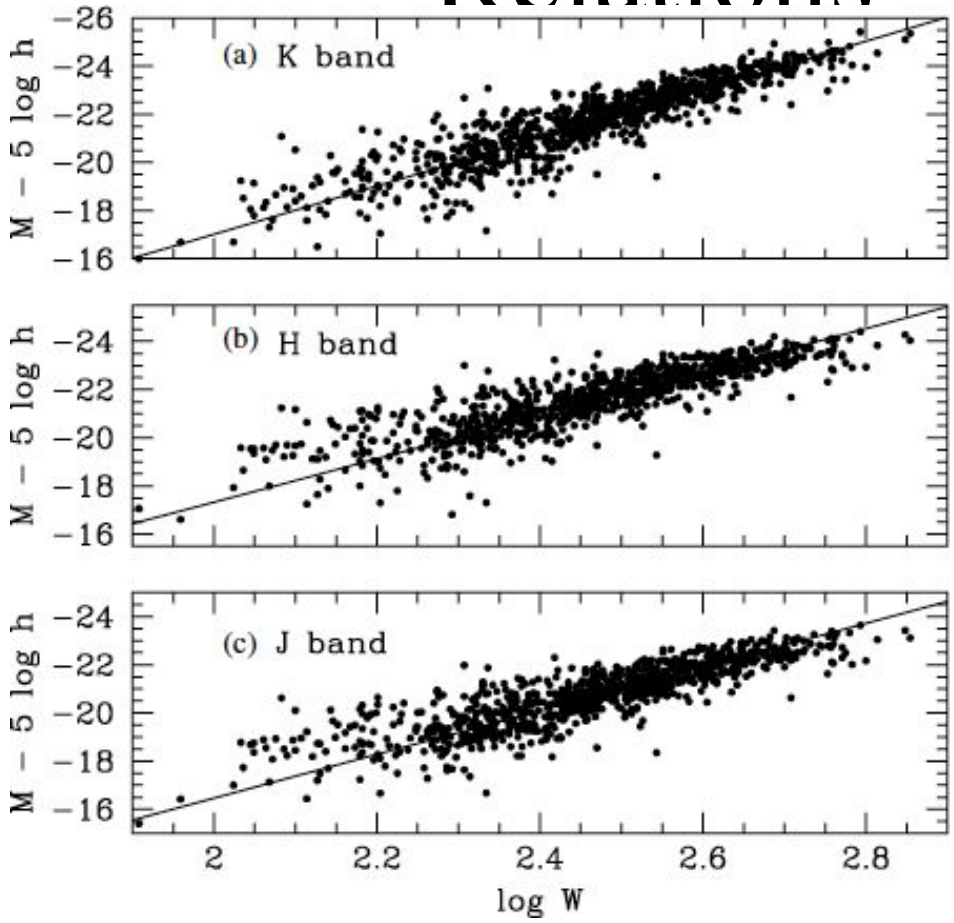


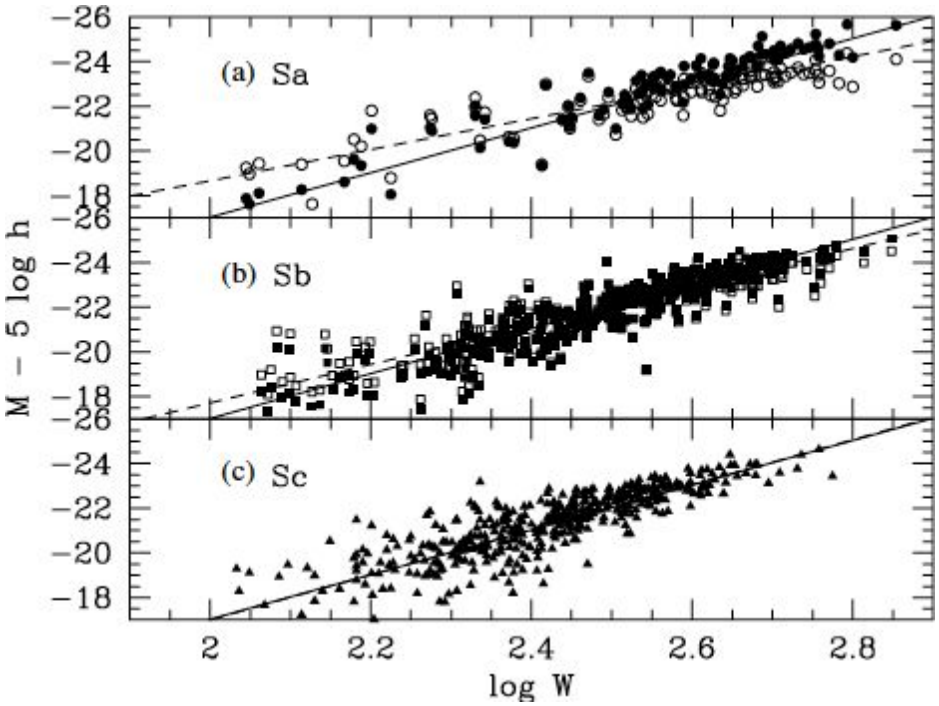
Tully-Fischer Relationship



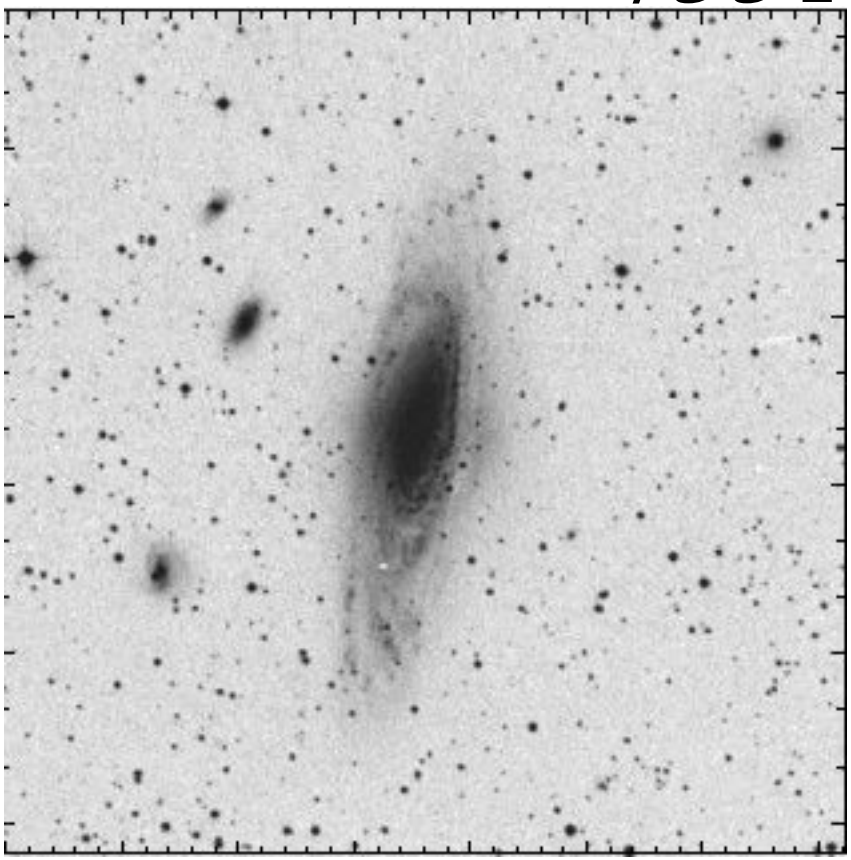


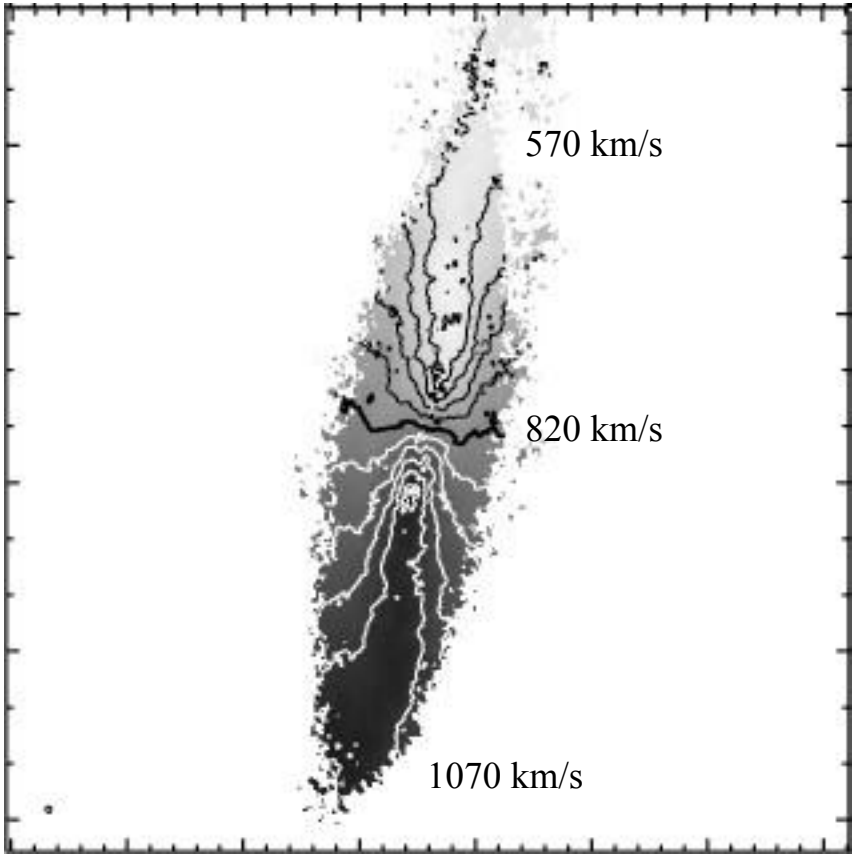
Tully-Fisher Relations





NGC 7331





Faber-Jackson

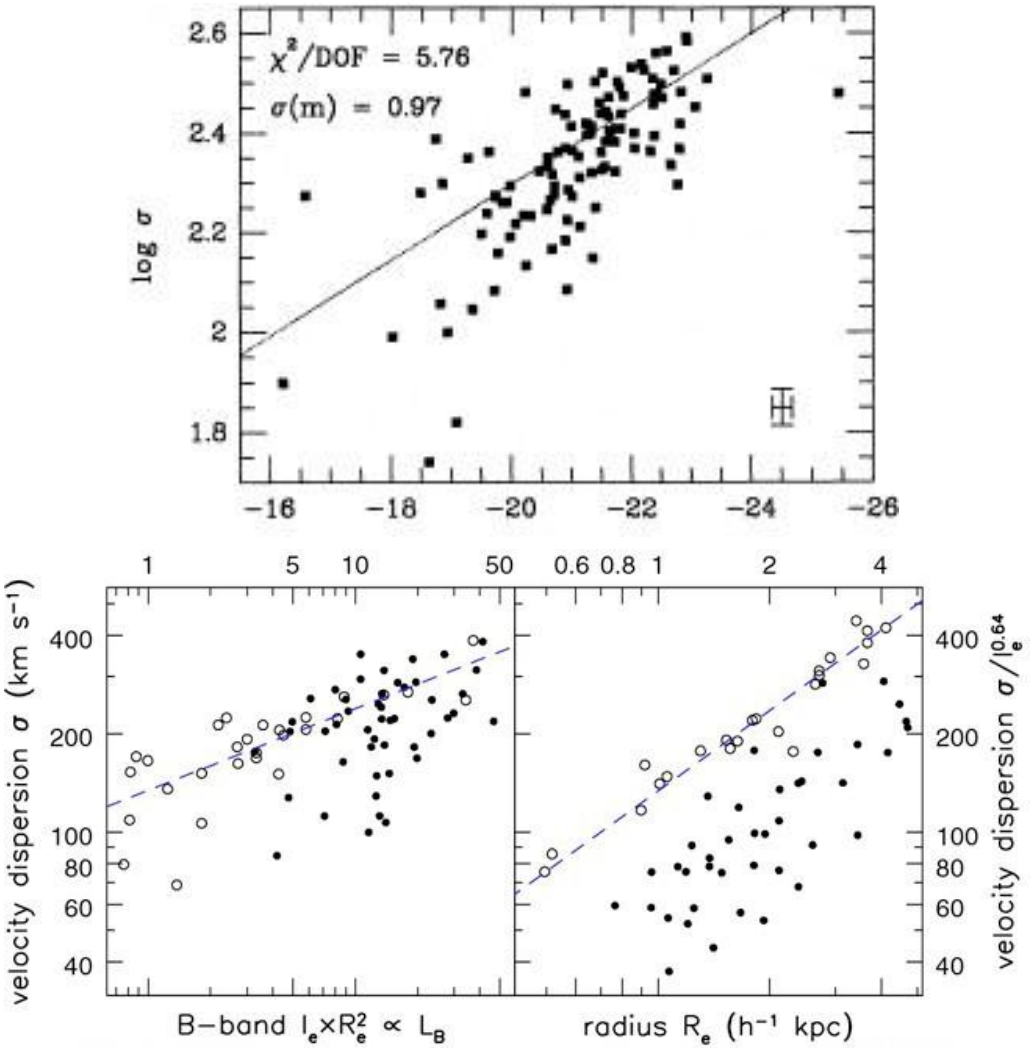
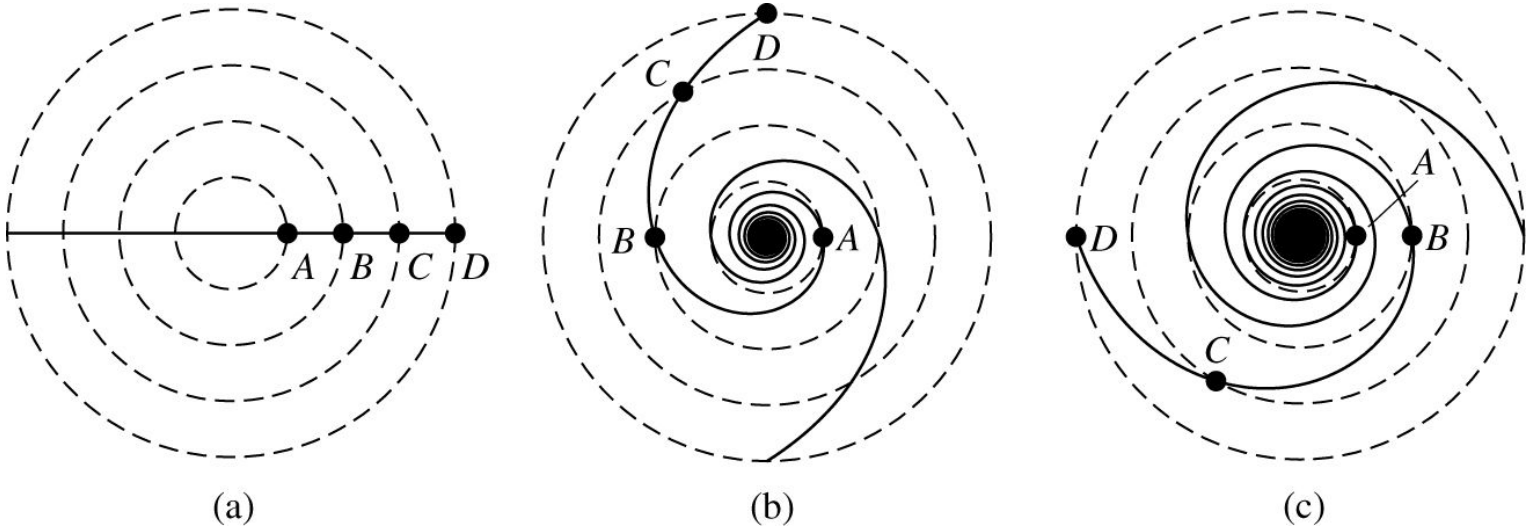


Fig 6.13 (T. Treu) 'Galaxies in the Universe' Sparke/Gallagher CUP 2007

Spiral Structure

Winding Problem



Density waves!

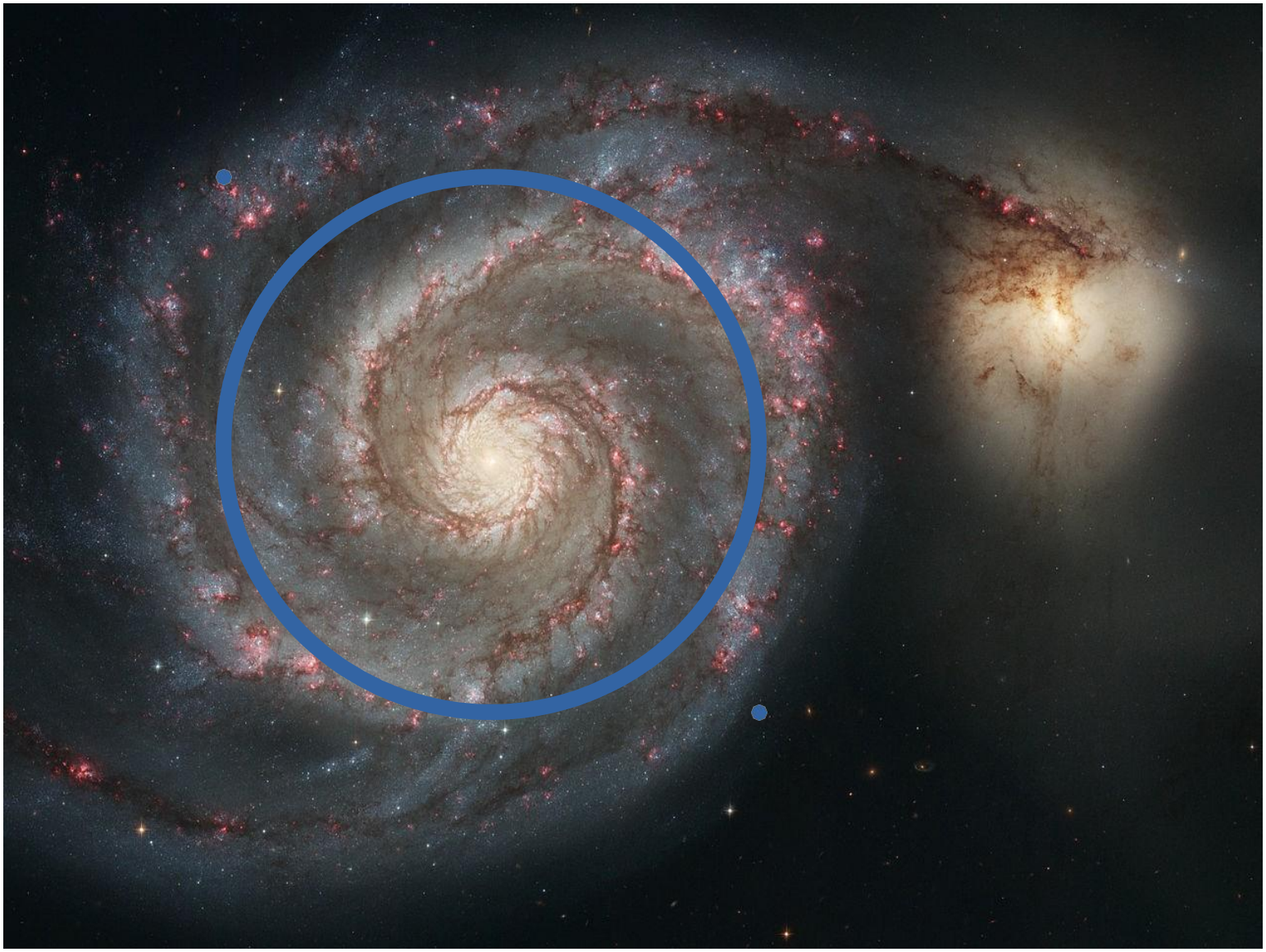
https://www.youtube.com/watch?v=7wm-pZp_mi0

Note:

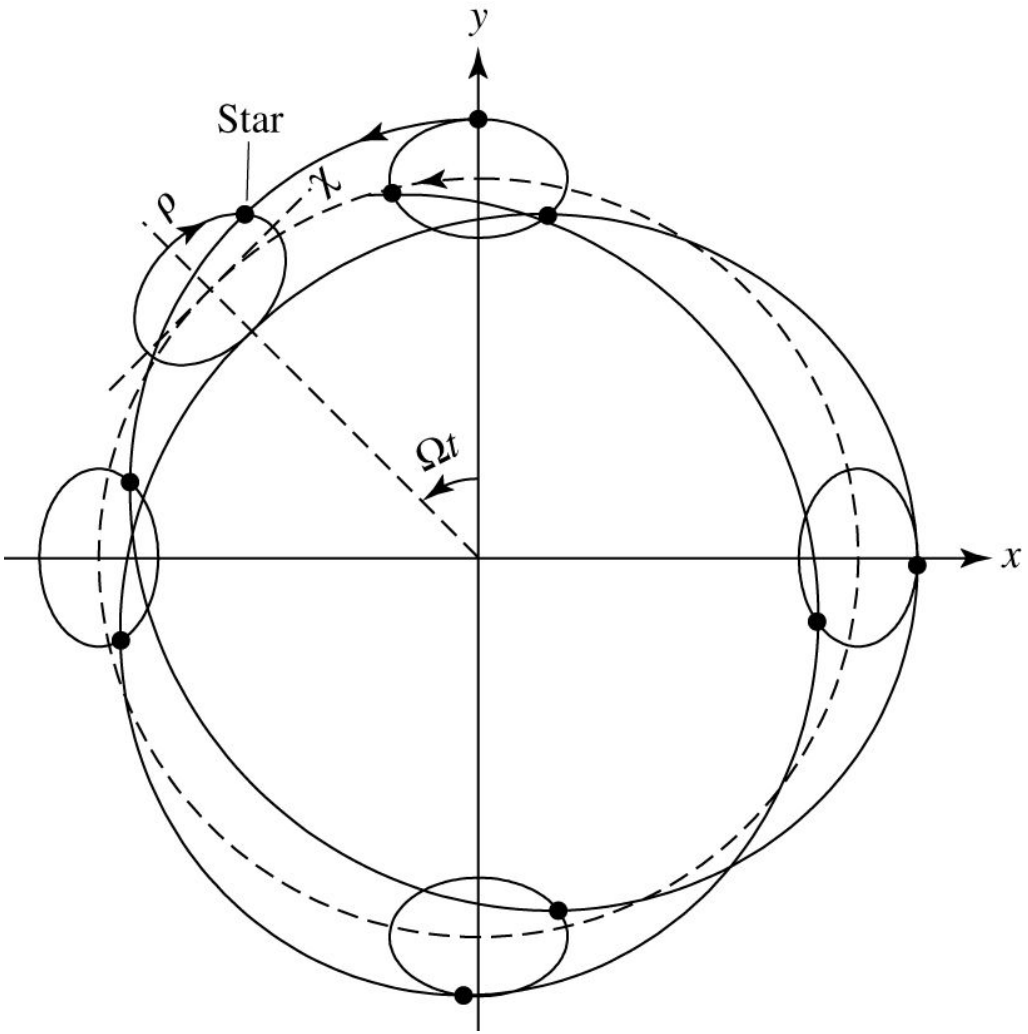
1) The traffic jam is just an overdensity of cars

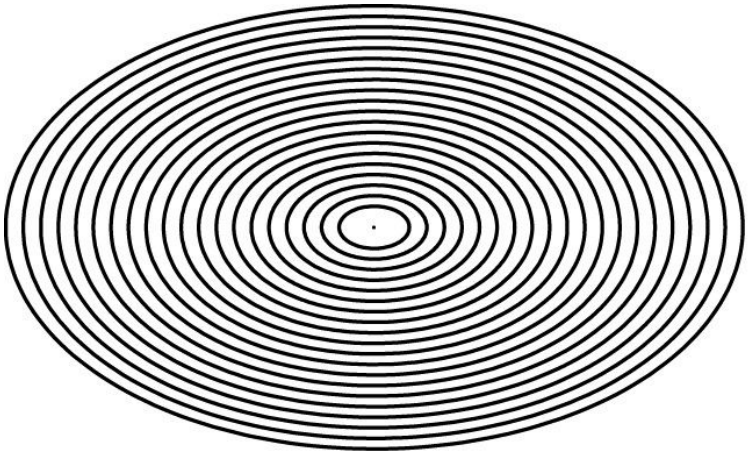
2) There is a pattern speed for the speed the traffic jam moves around the circle that can be expressed as radians/s

3) Individual cars move into and out of this density enhancement.

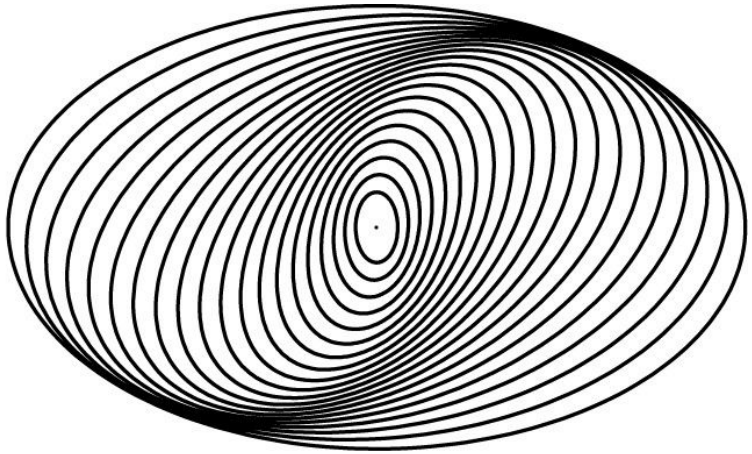


Stellar Orbits

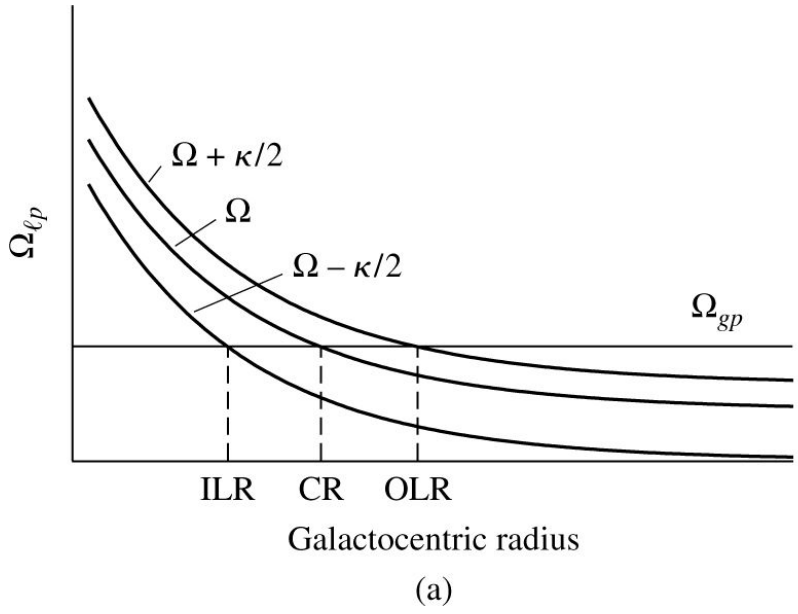




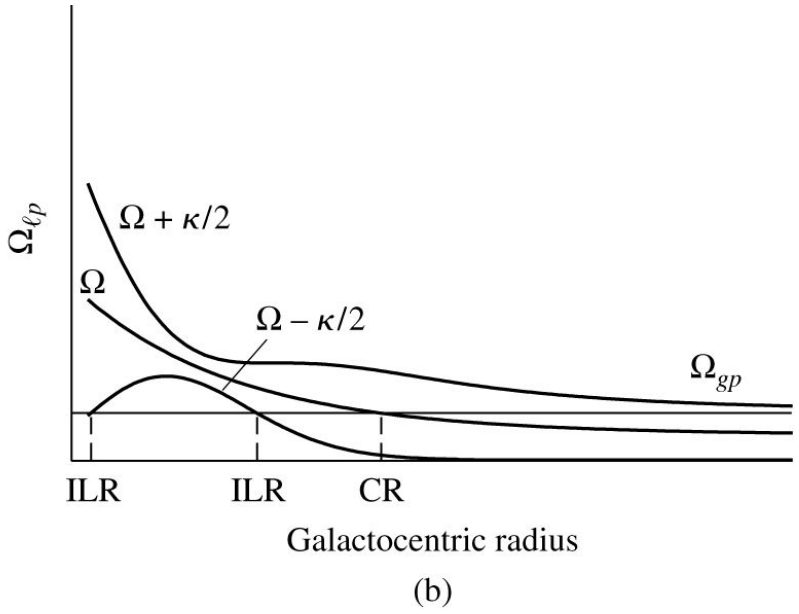
(a)



(b)


$\Omega + \kappa/2$
Ω
$\Omega - \kappa/2$
Ω_{gp}
$\Omega_{\ell p}$
ILR
CR
OLR
Galactocentric radius

(a)


$\Omega + \kappa/2$
Ω
$\Omega - \kappa/2$
Ω_{gp}
$\Omega_{\ell p}$
ILR
ILR
CR
Galactocentric radius

(b)