Universidad Industrial de Santander

GRUPO HALLEY DE ASTRONOMÍA Y CIENCIAS AEROESPACIALES

Astronomía Planetaria

Clase 22 – Galaxias

Mauricio Suárez Durán

Escuela de Física
Grupo Halley de Astronomía y Ciencias Aeroespaciales
Universidad Industrial de Santander

Bucaramanga, II semestre de 2013

En nuestro capitulo anterior

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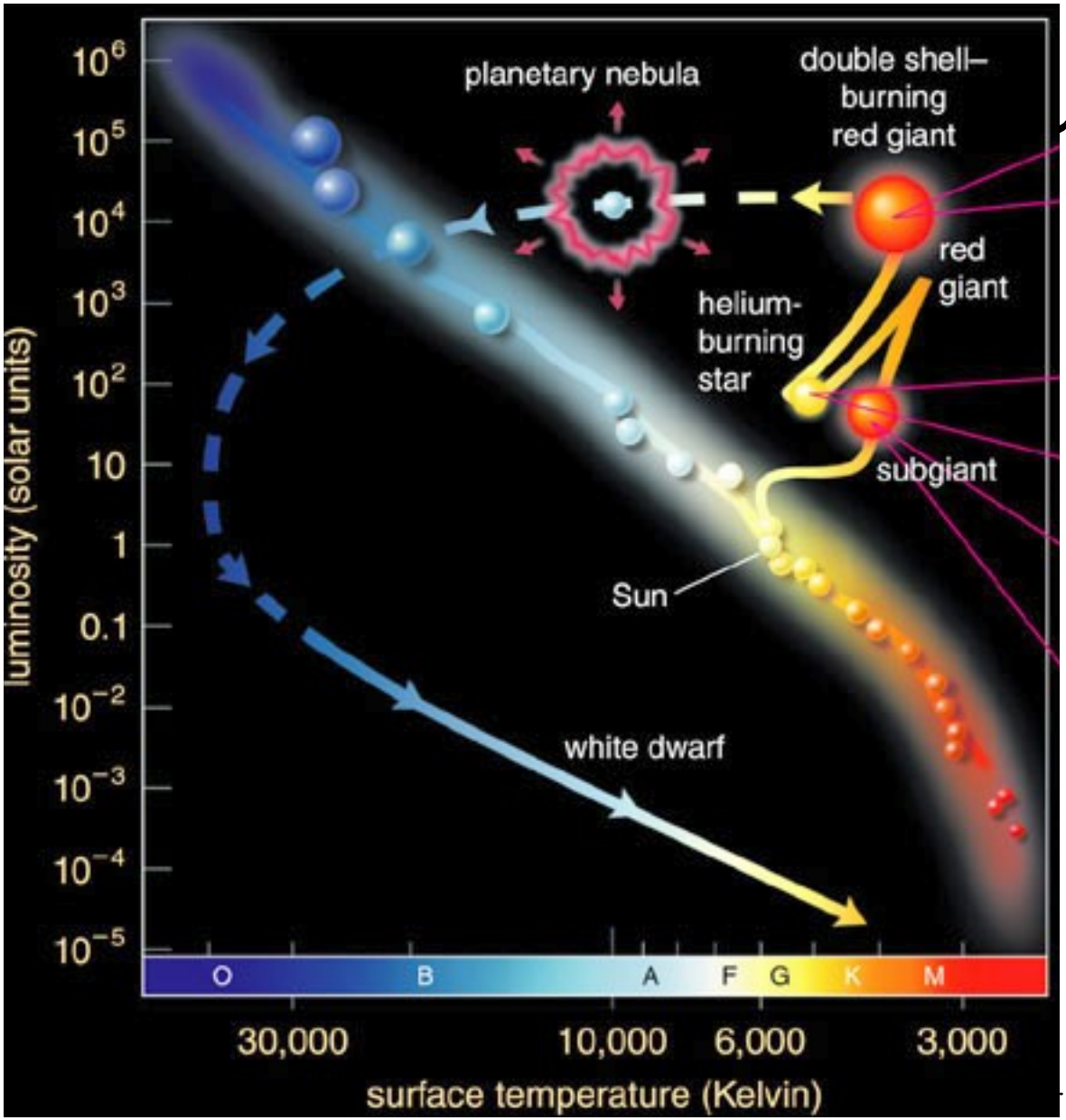

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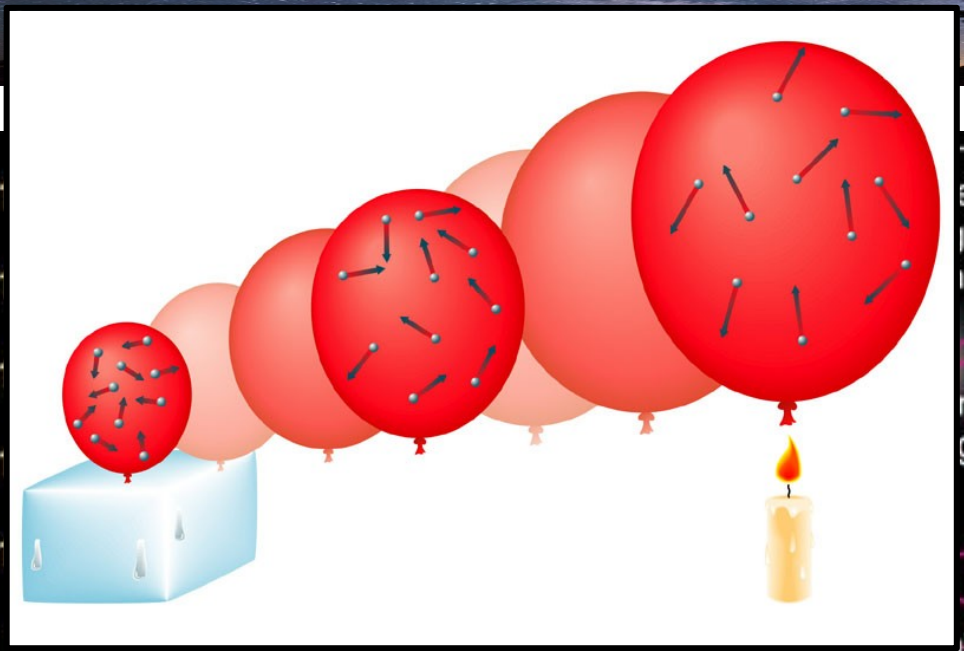
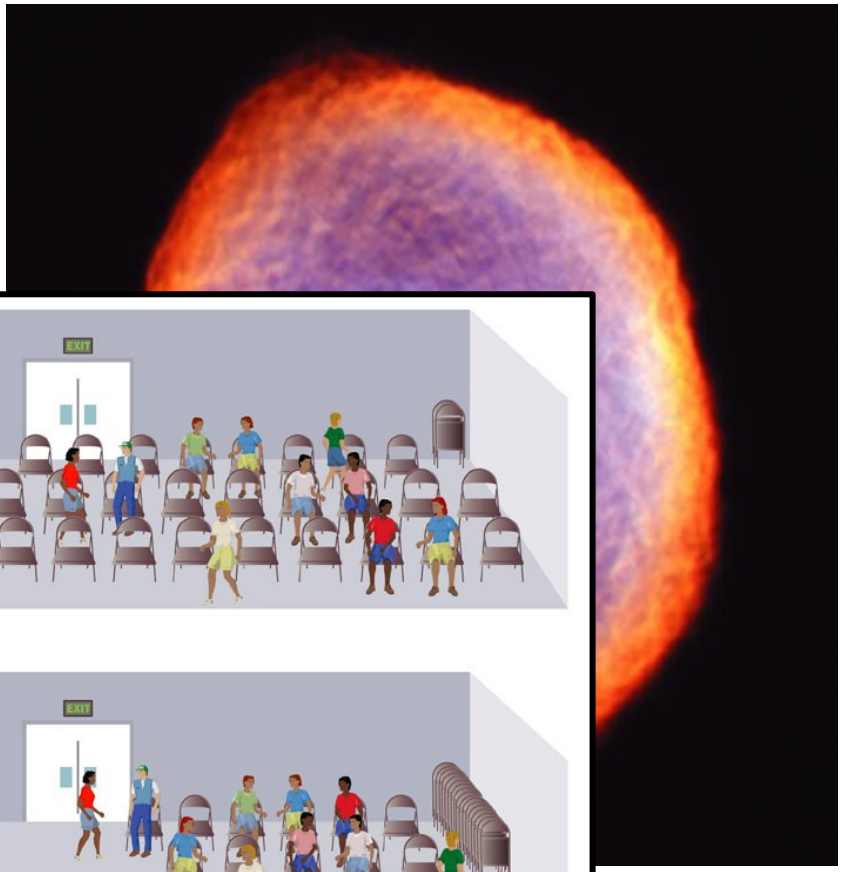
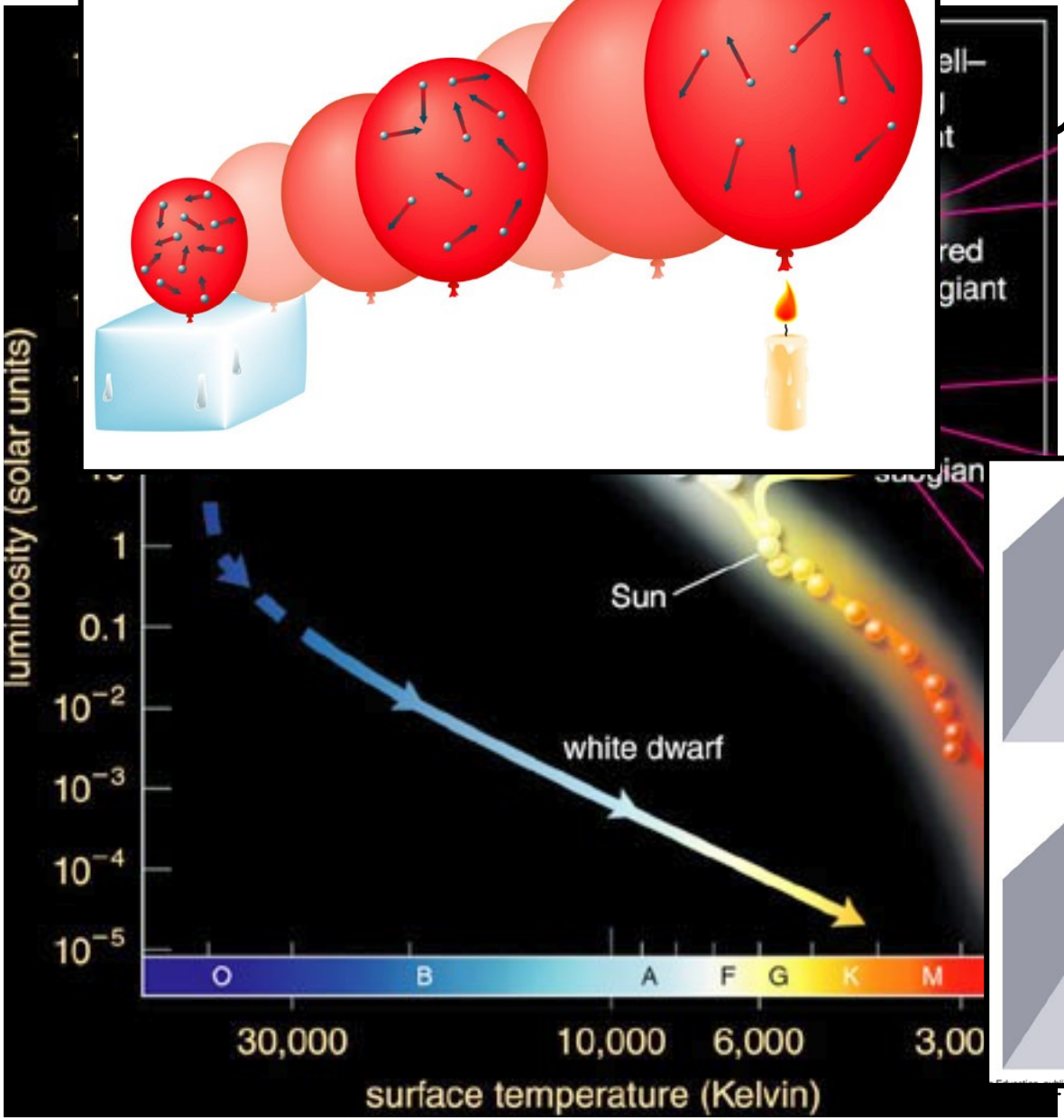
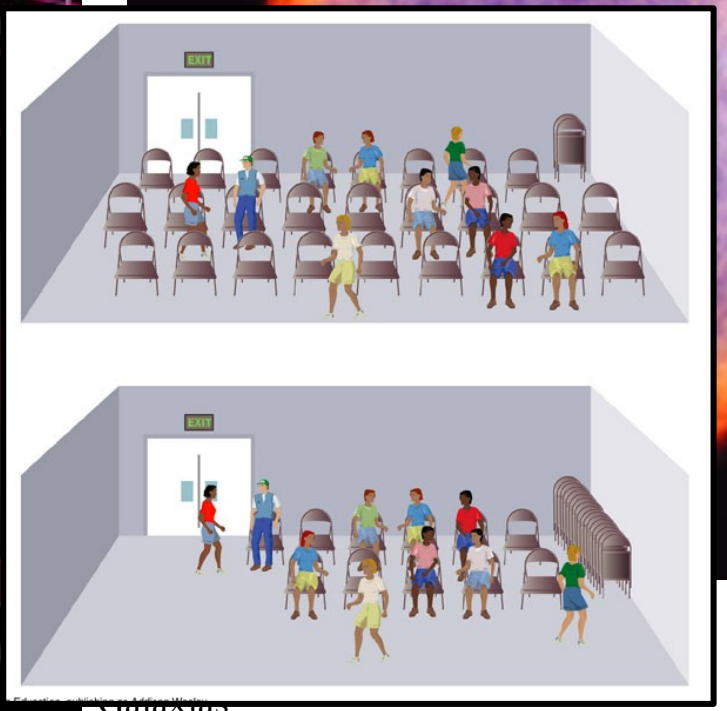


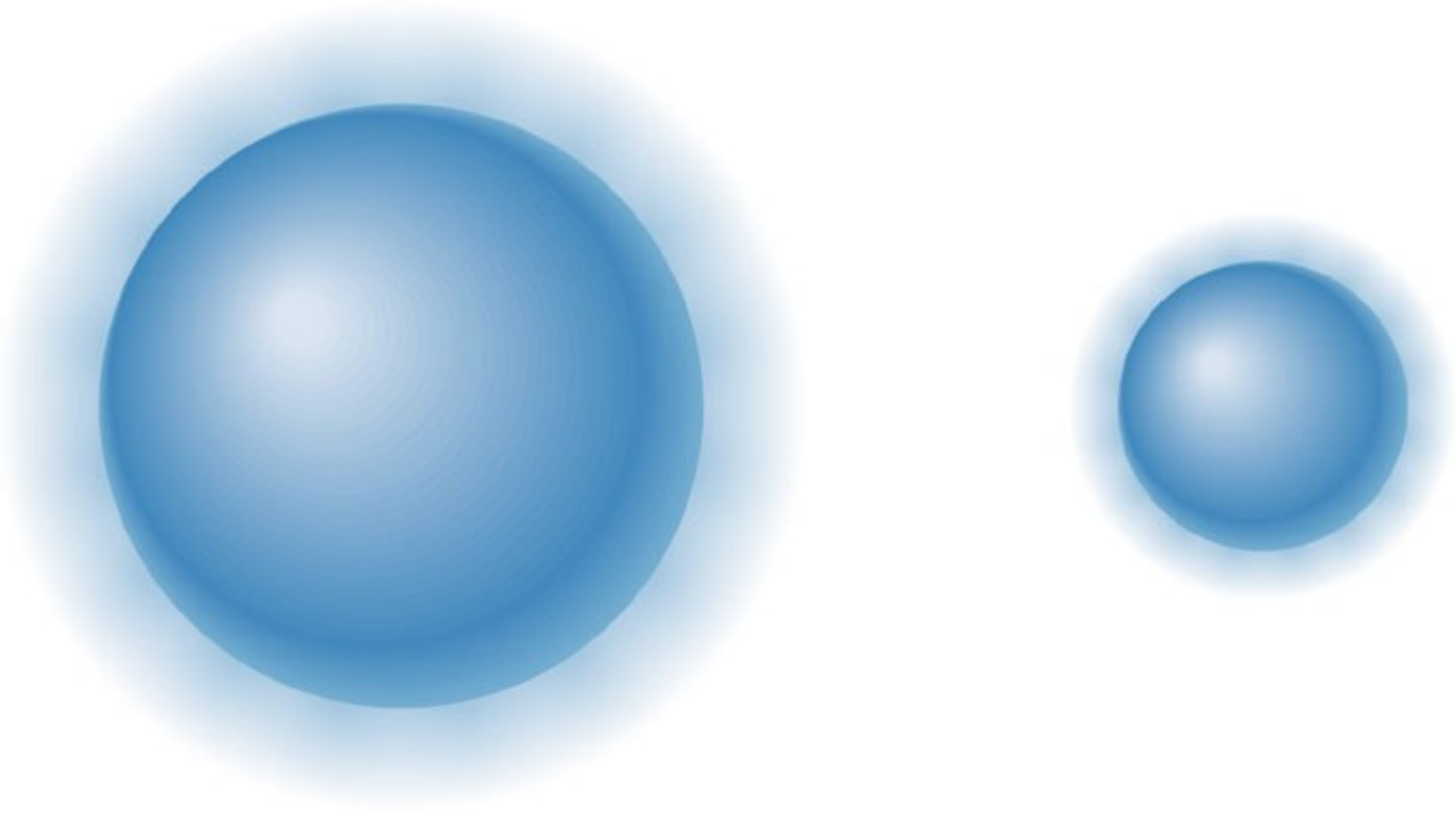






$1.0M_{Sun}$ white dwarf

$1.3M_{Sun}$ white dwarf



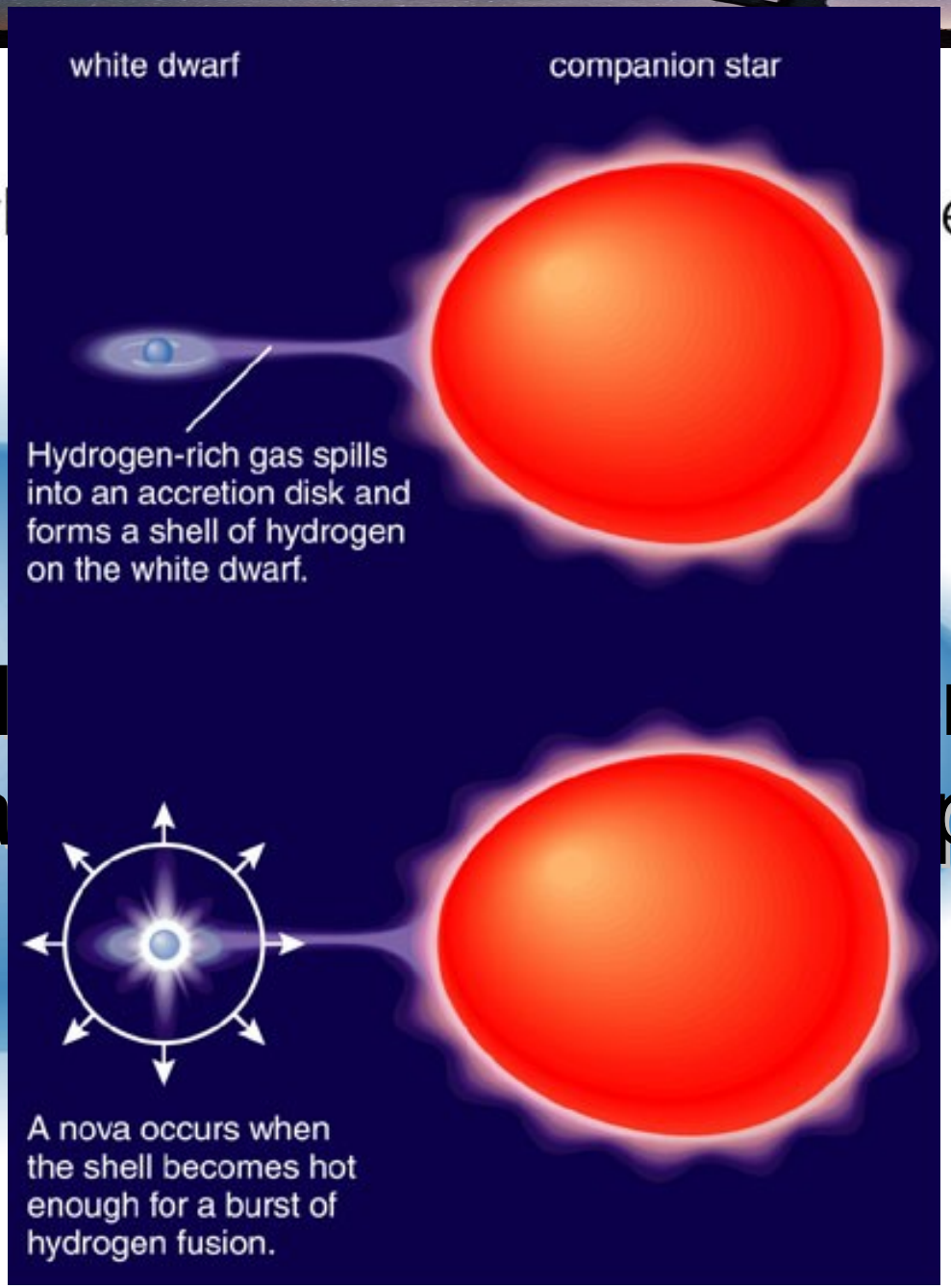
$1.0M_{Sun}$ white dwarf

$1.3M_{Sun}$ white dwarf

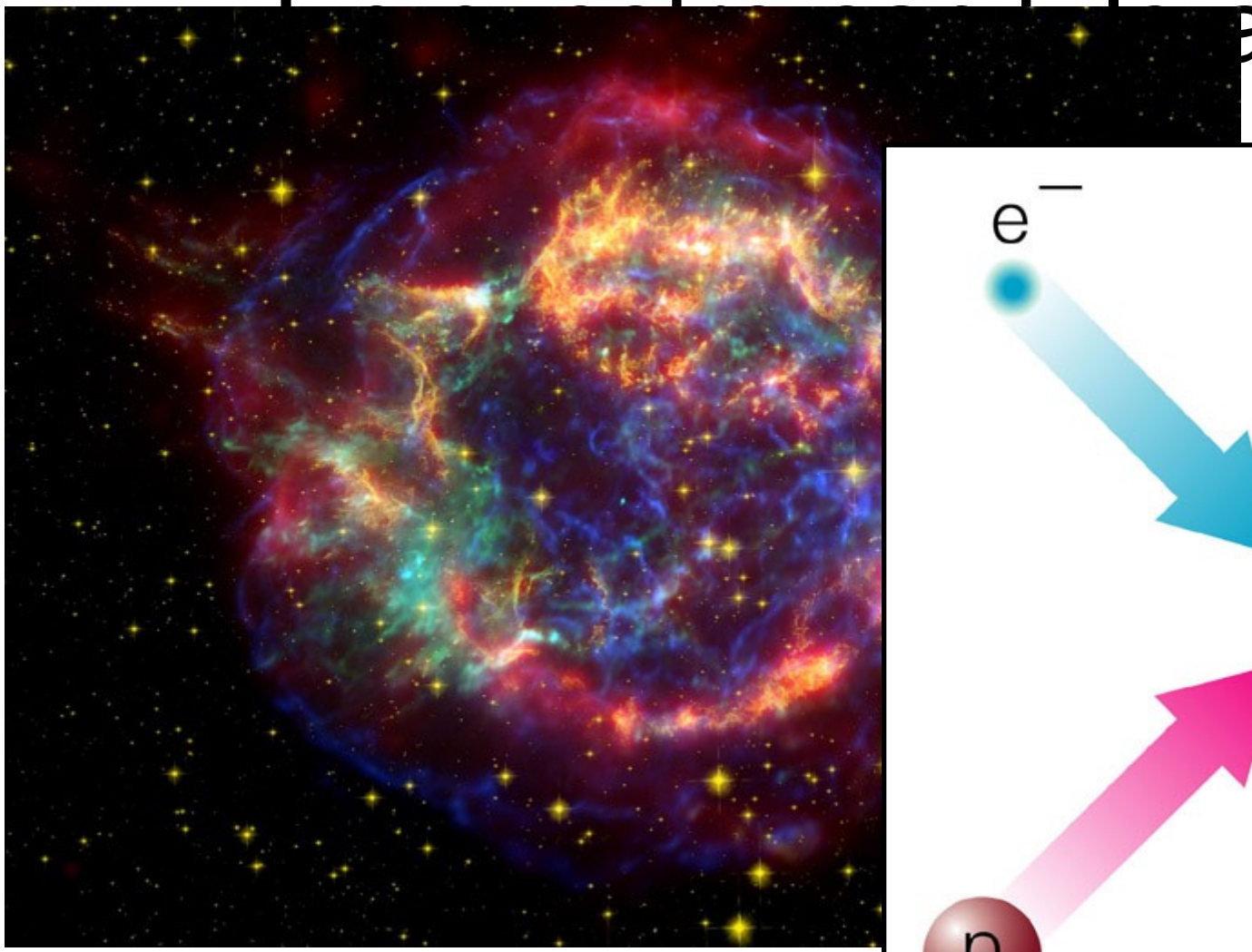
- Cuando los electrones logran velocidades cercanas a *c*, la presión de degeneración no puede soportar el colapso.

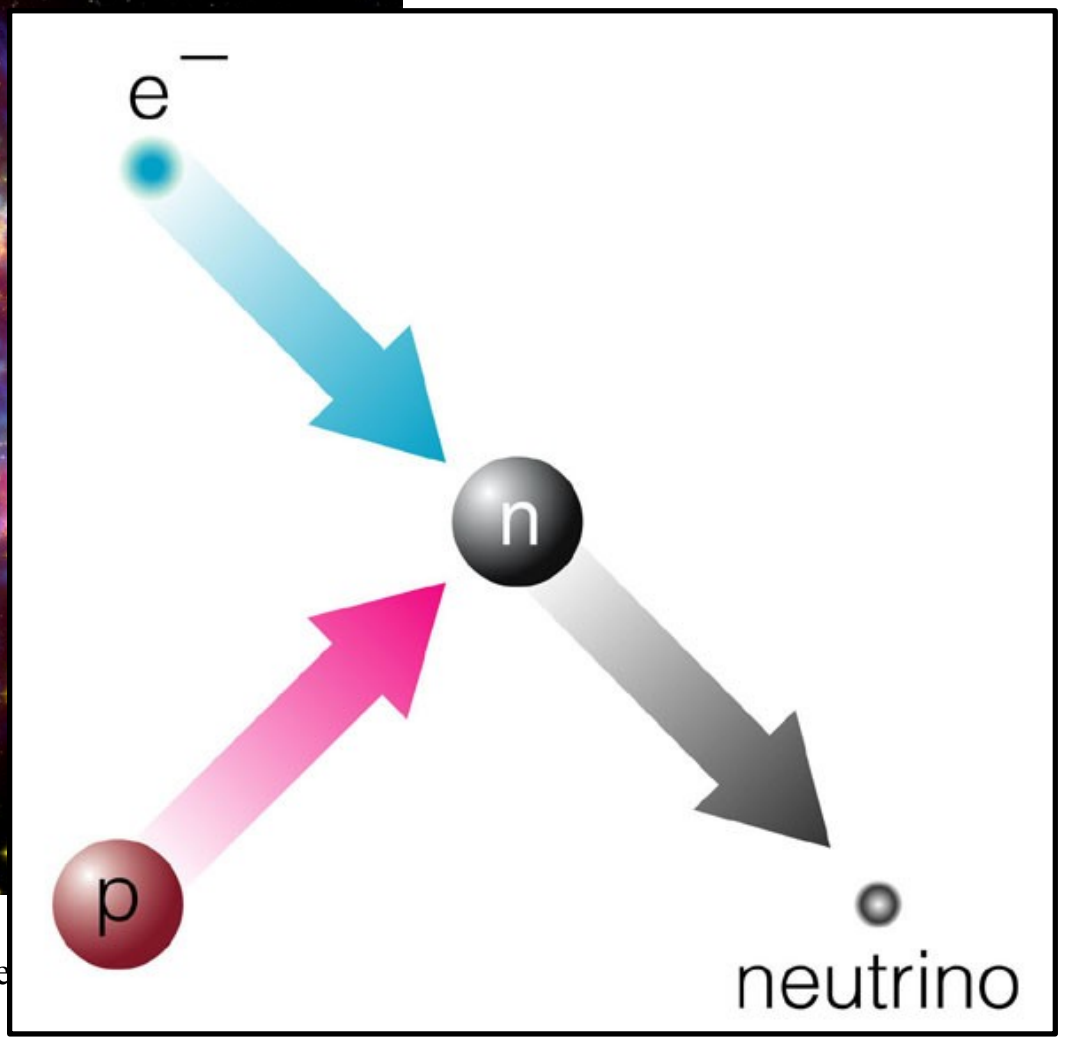
$1.0M_{Sun}$ w e dwarf

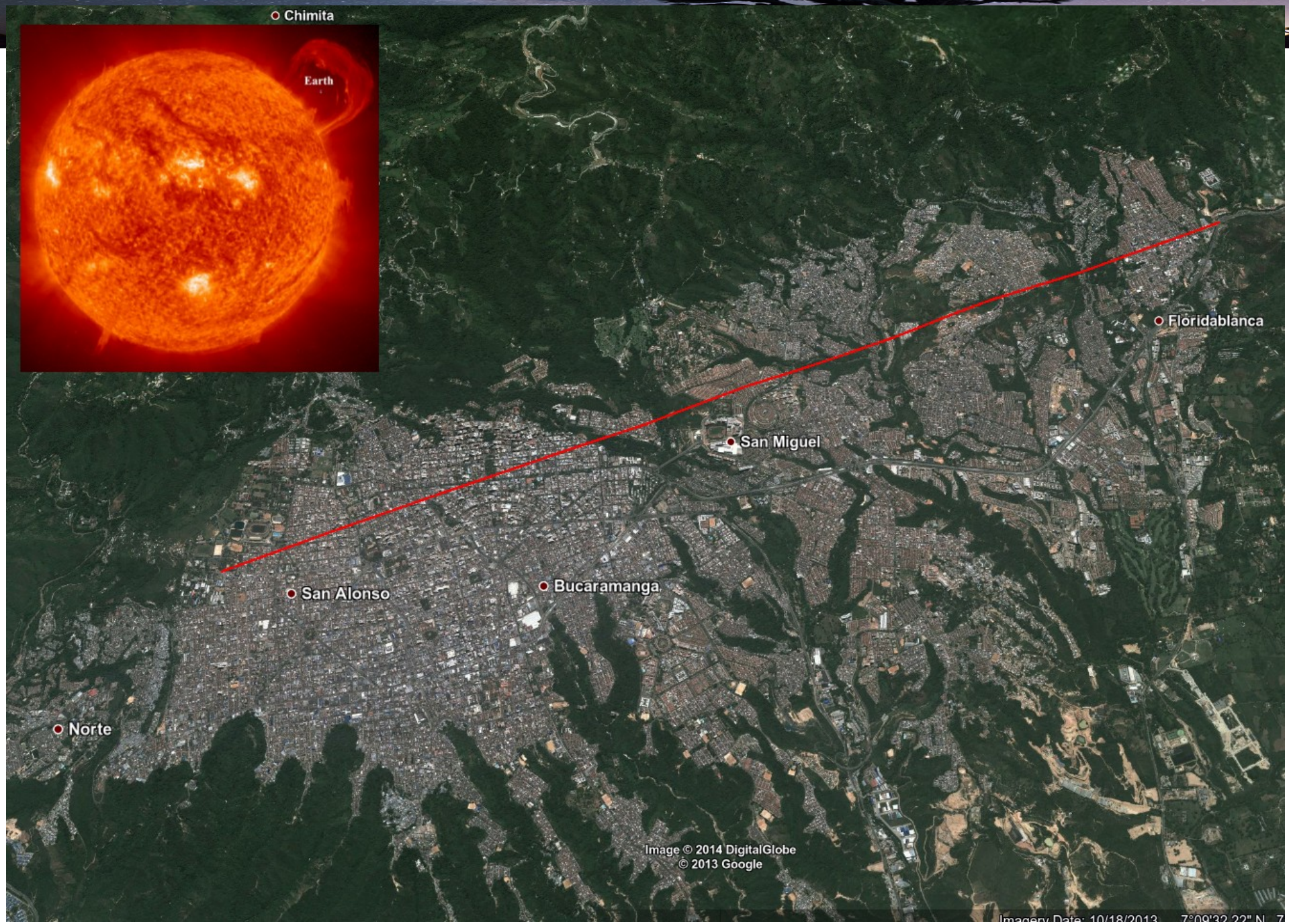
- Cuando logran velocidad resión de degenera portar el colapso.

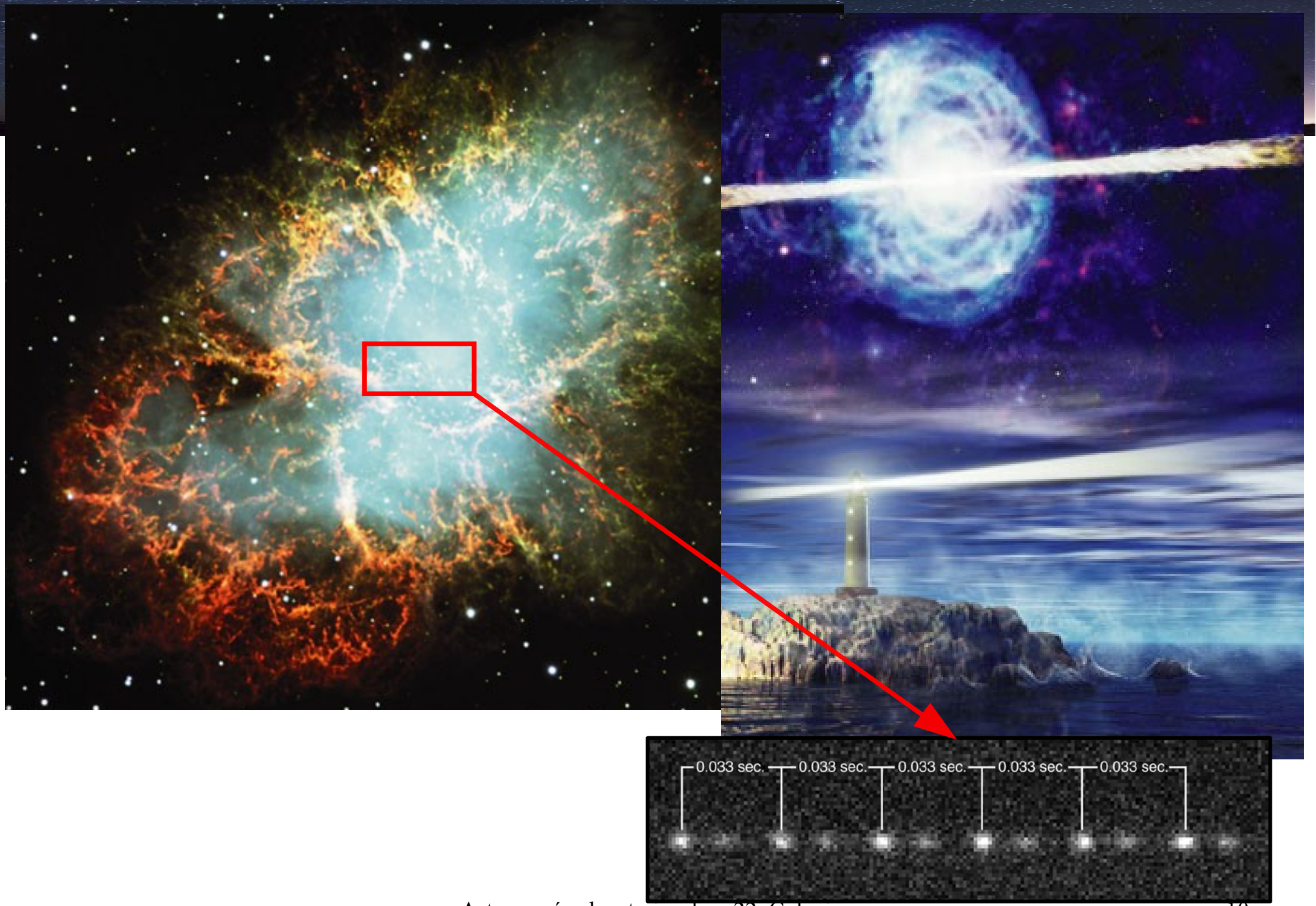


anterior






Chimita
Earth
Floridablanca
San Miguel
San Alonso
Bucaramanga
Norte
Image © 2014 DigitalGlobe
© 2013 Google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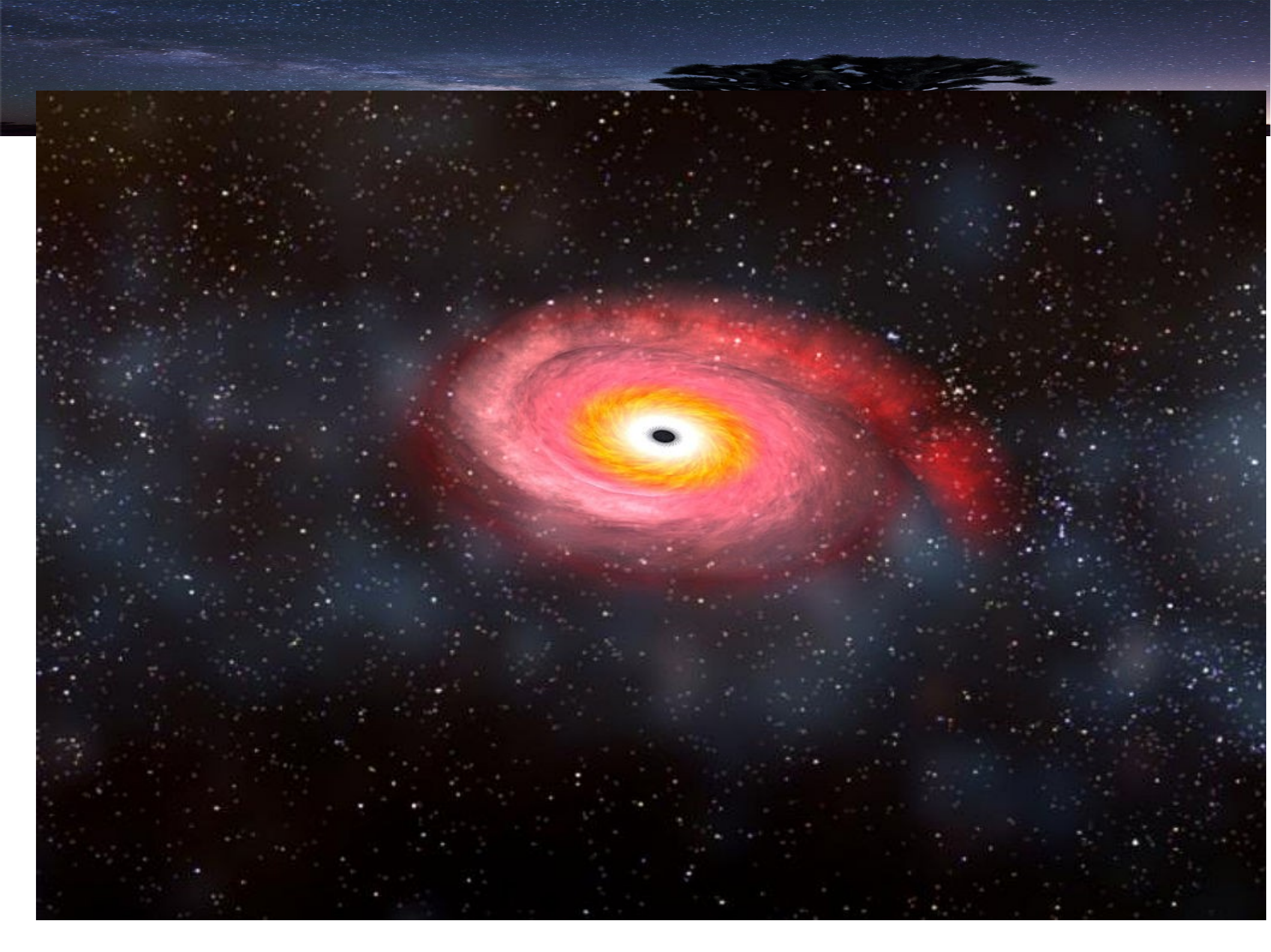
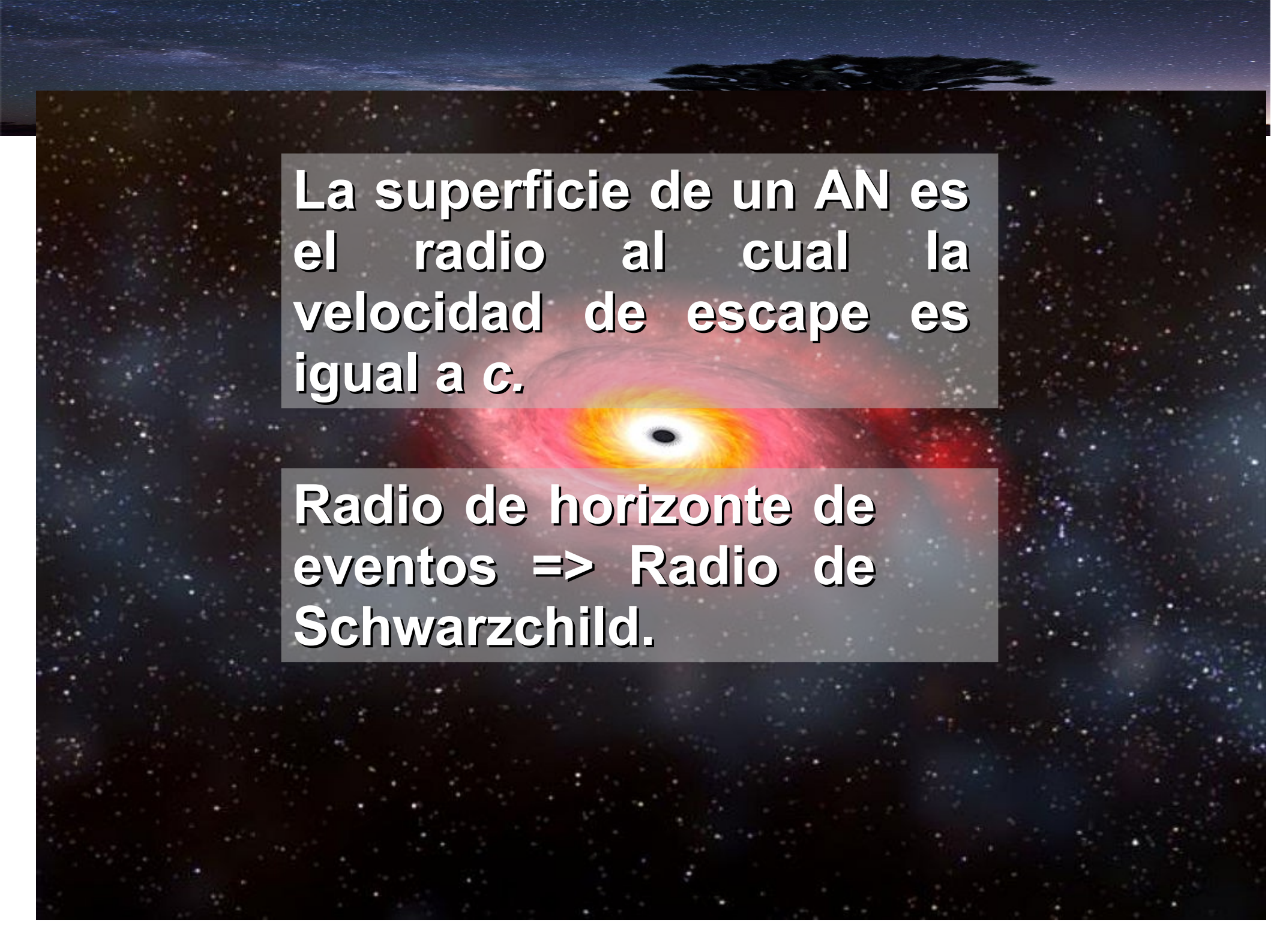
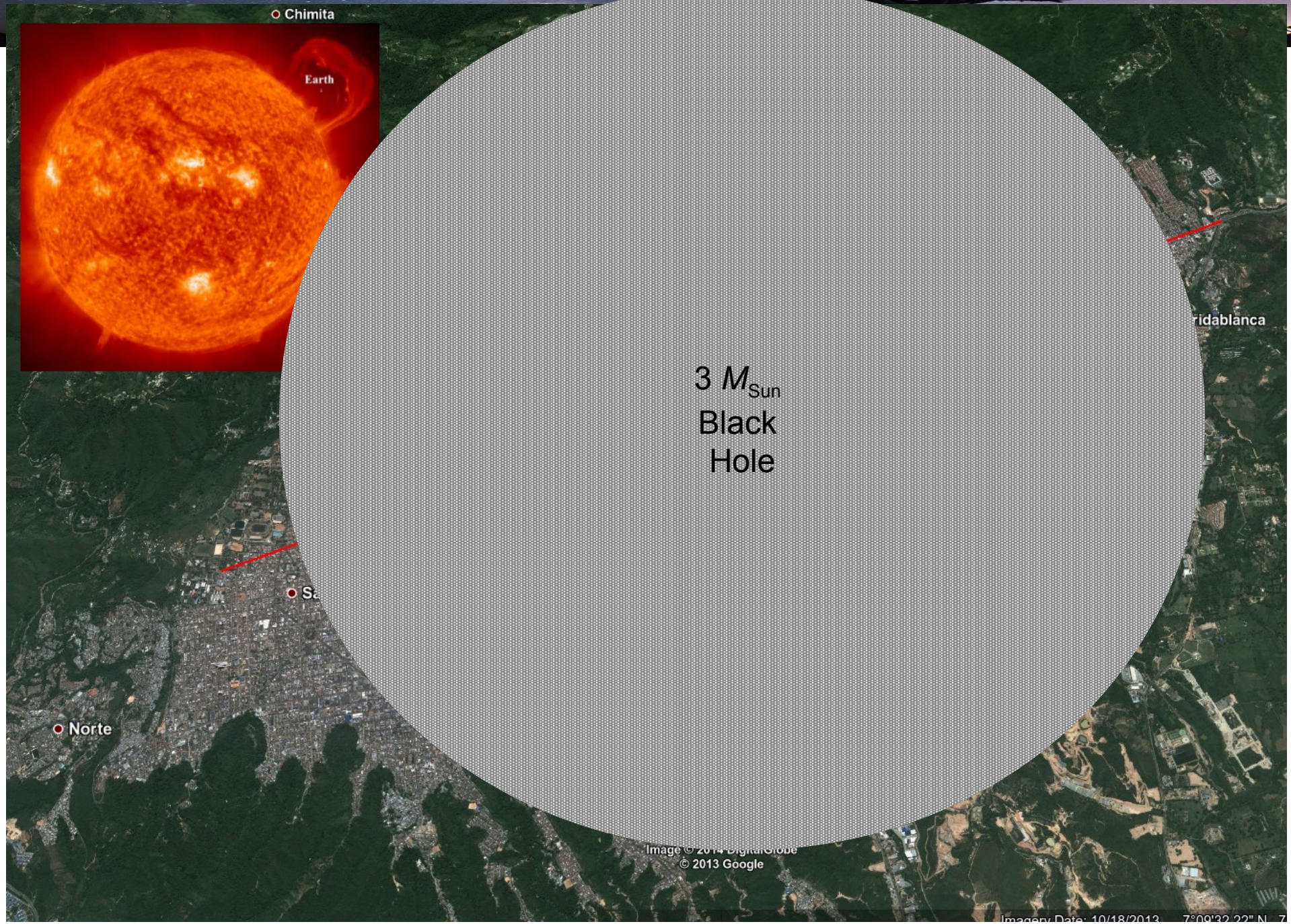




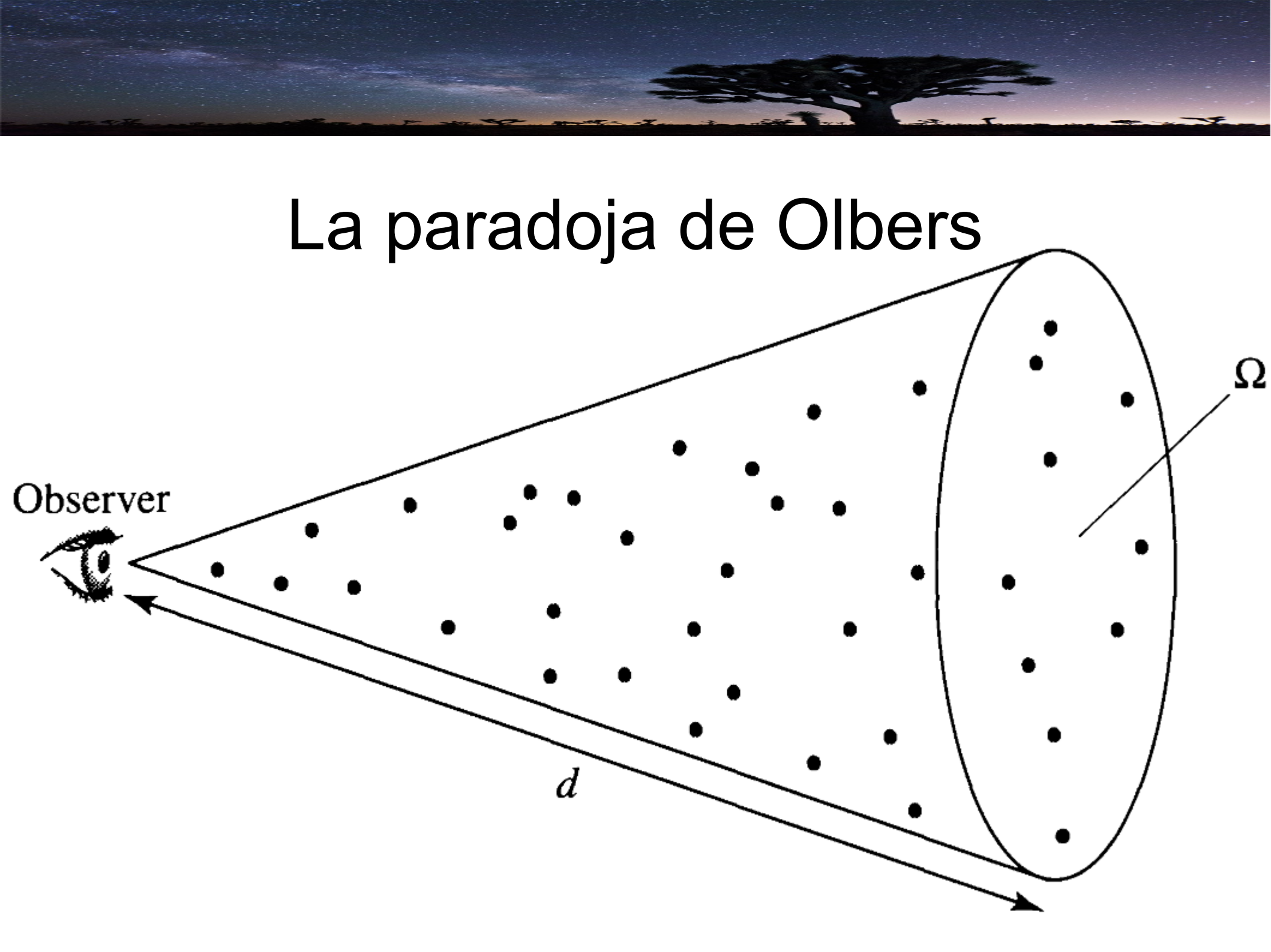
La superficie de un AN es el radio al cual la velocidad de escape es igual a *c*.

Radio de horizonte de eventos => Radio de Schwarzchild.

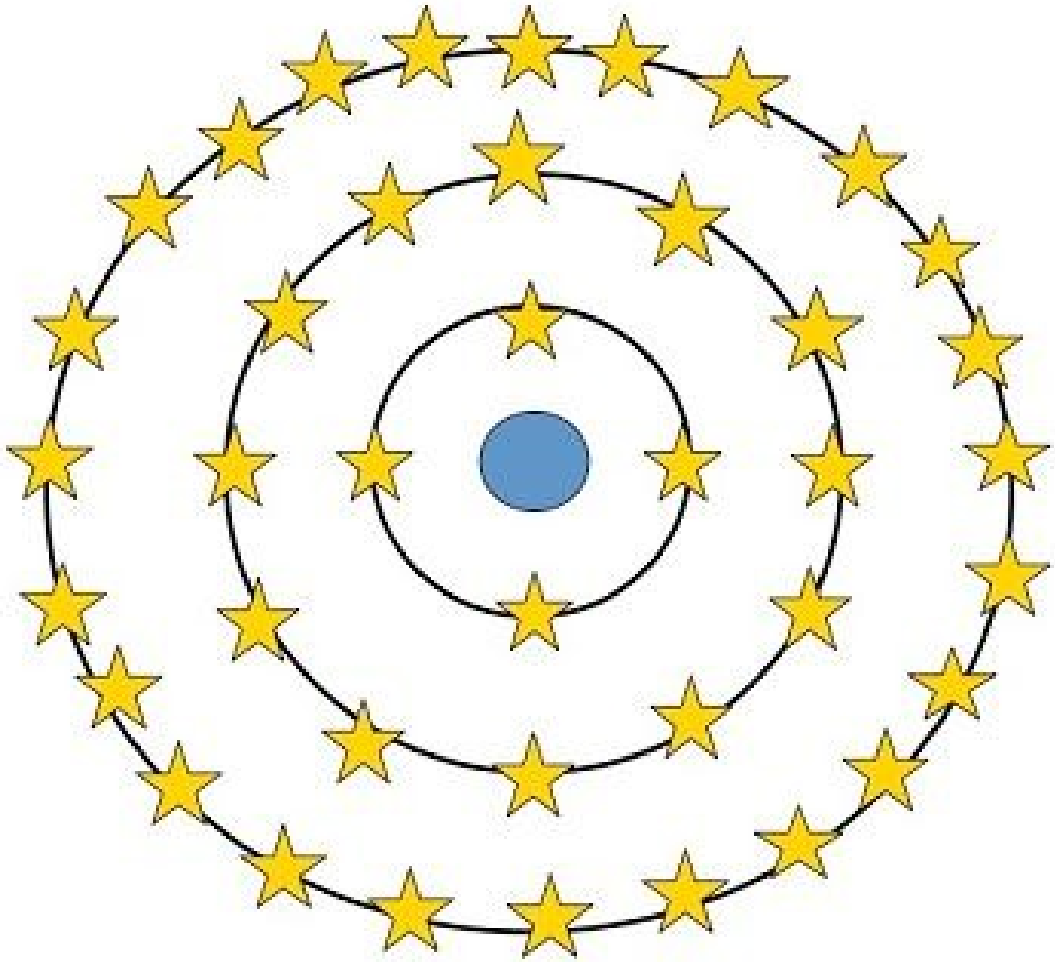

Chimita
Earth
3 M_{Sun}
Black
Hole
Norte
© 2013 Google

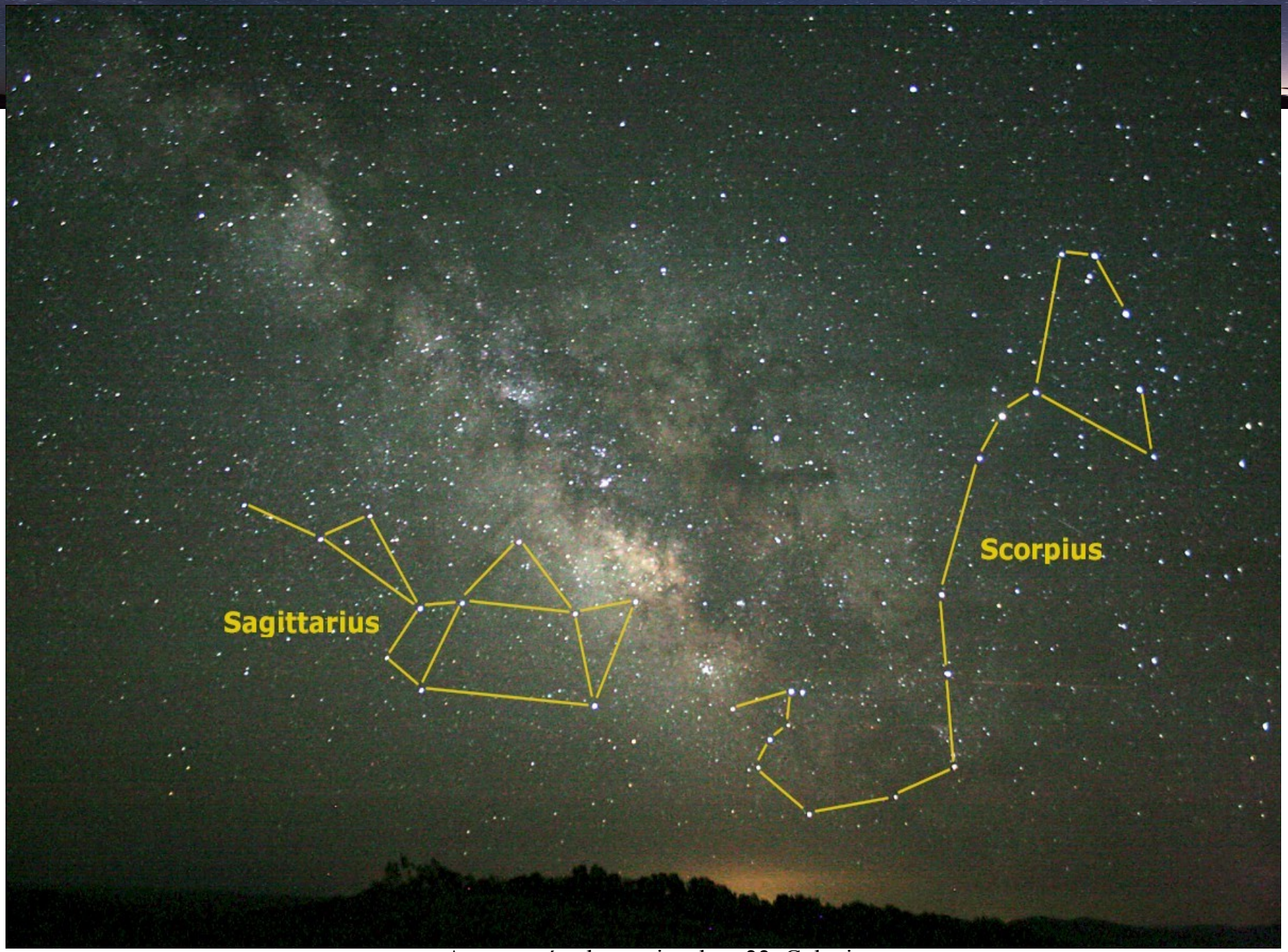
La Vía Láctea

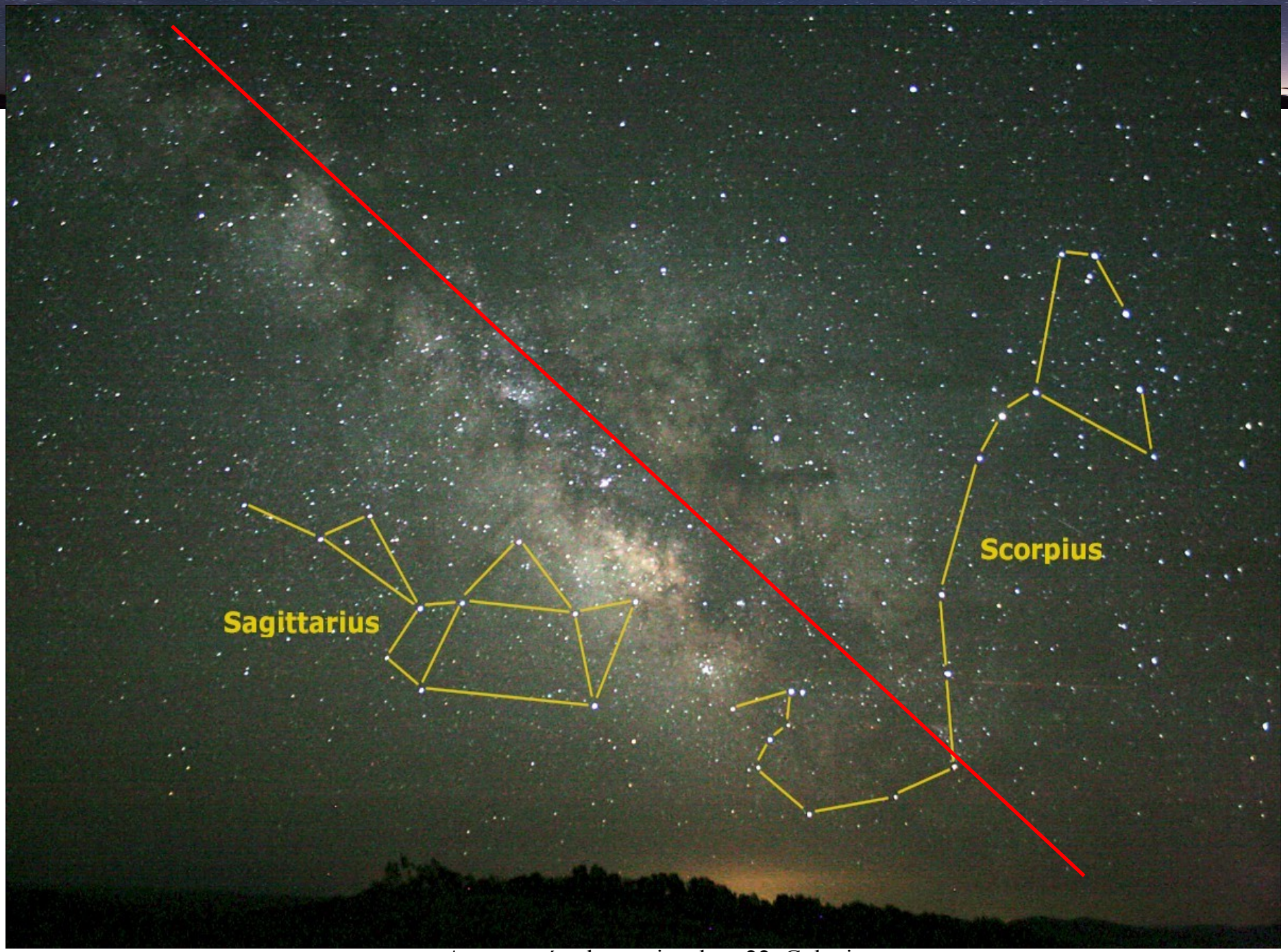
La paradoja de Olbers



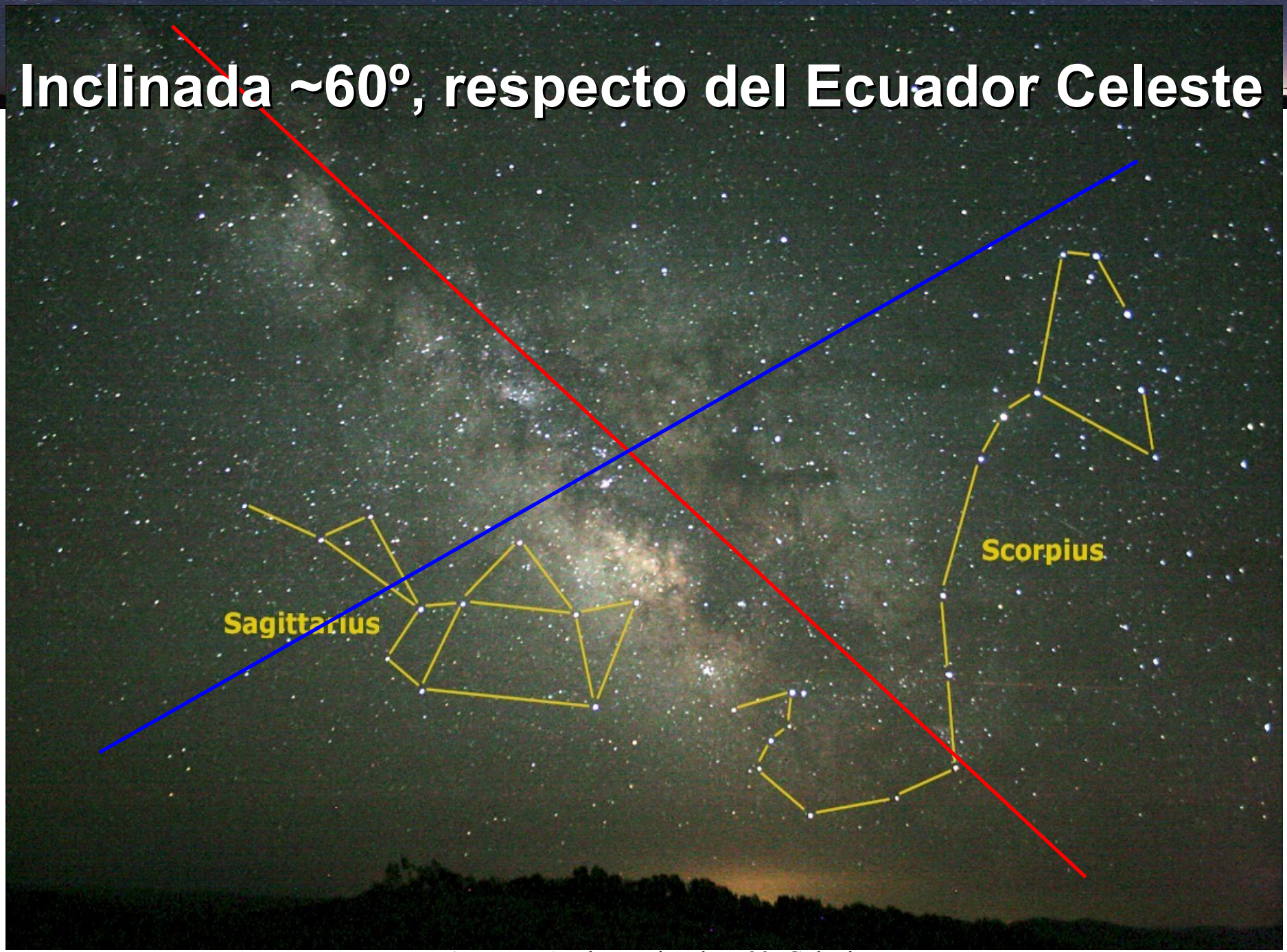
La paradoja de Olbers

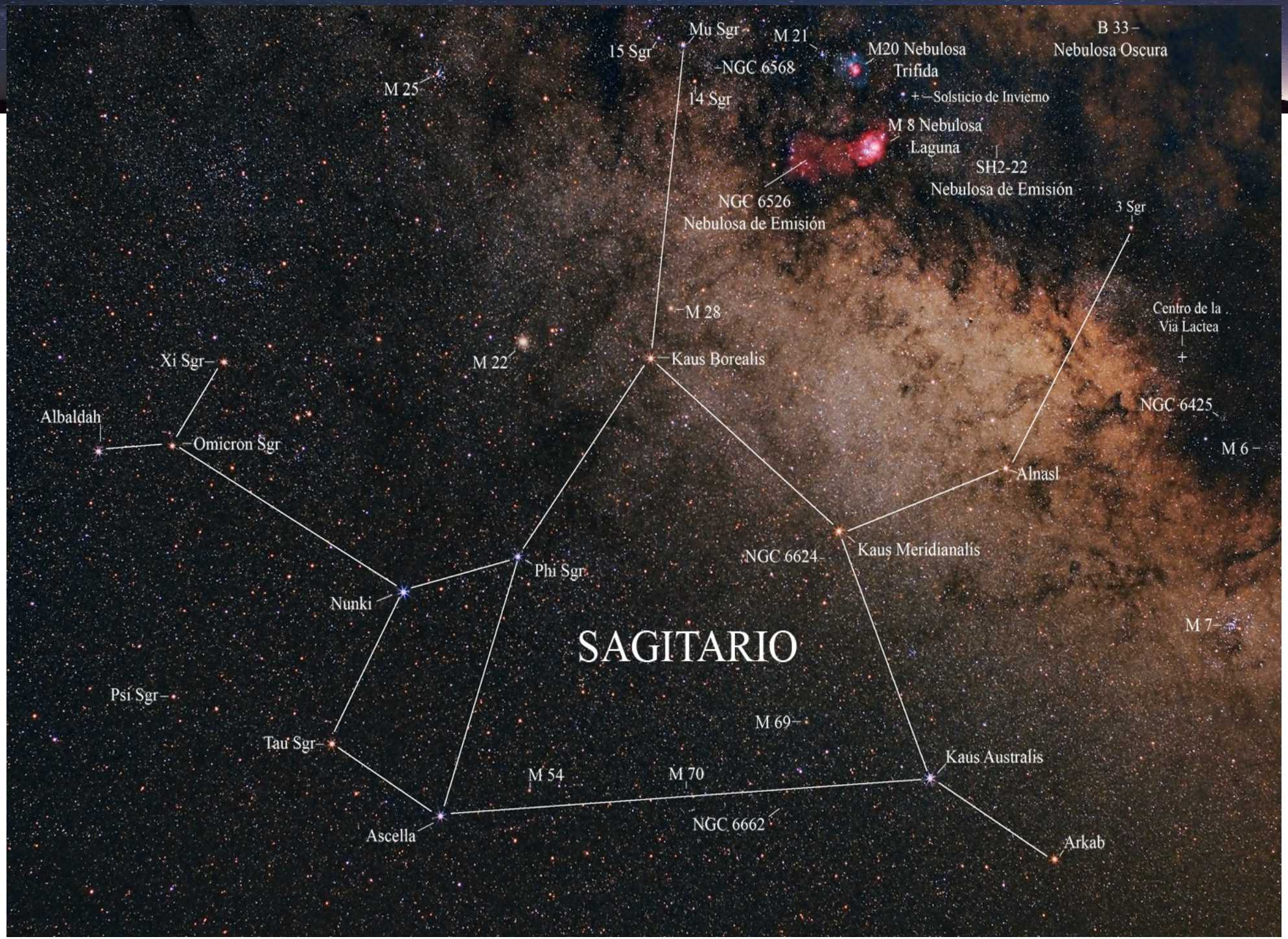



Sagittarius
Scorpius


Sagittarius
Scorpius

Inclinada ~60º, respecto del Ecuador Celeste




Mu Sgr
M 21
B 33
Nebulosa Oscura
15 Sgr
M20 Nebulosa
Trifida
NGC 6568
M 25
14 Sgr
Solsticio de Invierno
M 8 Nebulosa
Laguna
SH2-22
Nebulosa de Emisión
NGC 6526
Nebulosa de Emisión
3 Sgr
M 28
Centro de la
Vía Láctea
Xi Sgr
M 22
Kaus Borealis
NGC 6425
Albaldah
Omicron Sgr
M 6
Alnasl
Kaus Meridianalis
NGC 6624
Phi Sgr
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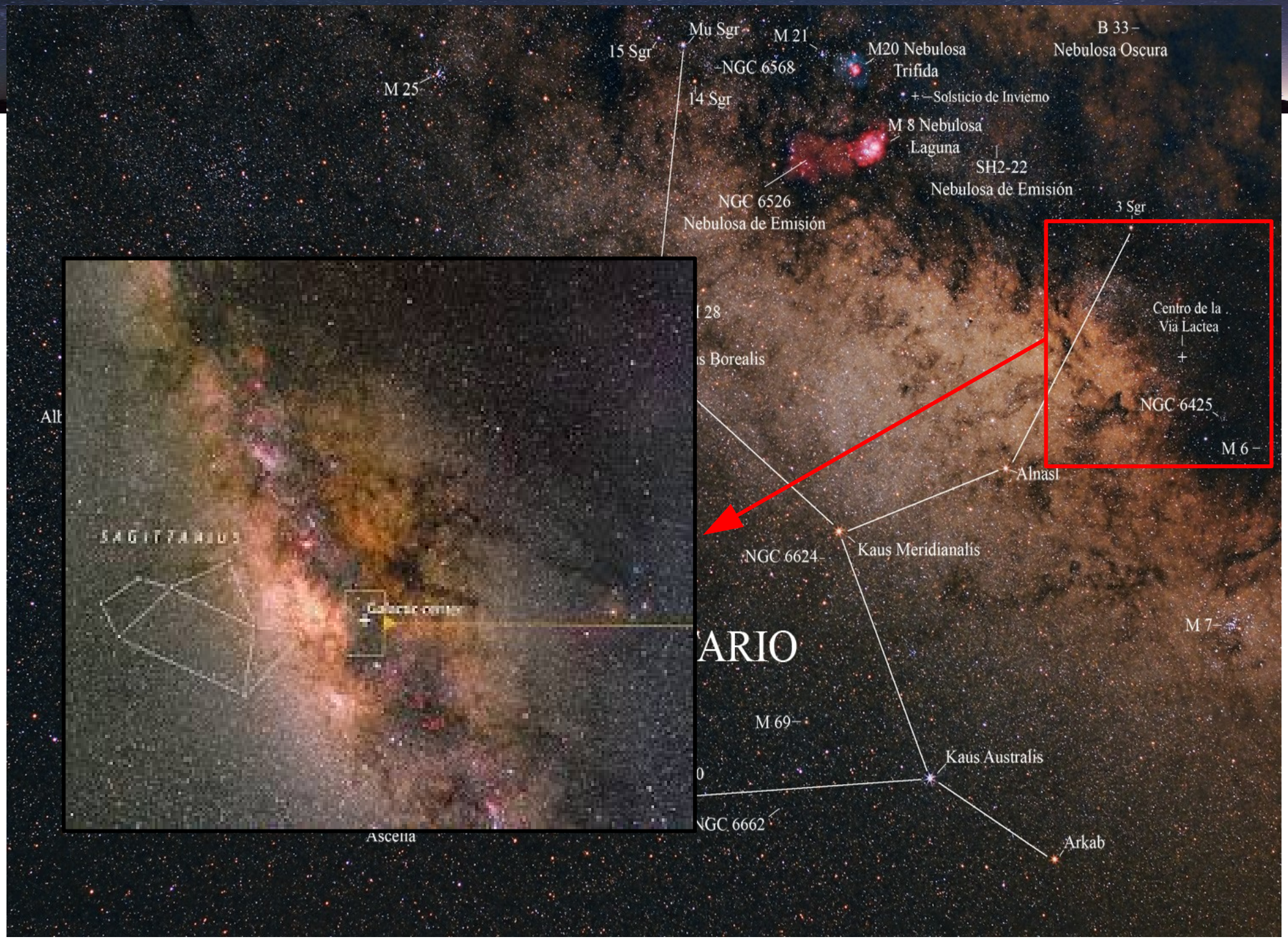
Arkab


Mu Sgr
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3 Sgr
Centro de la
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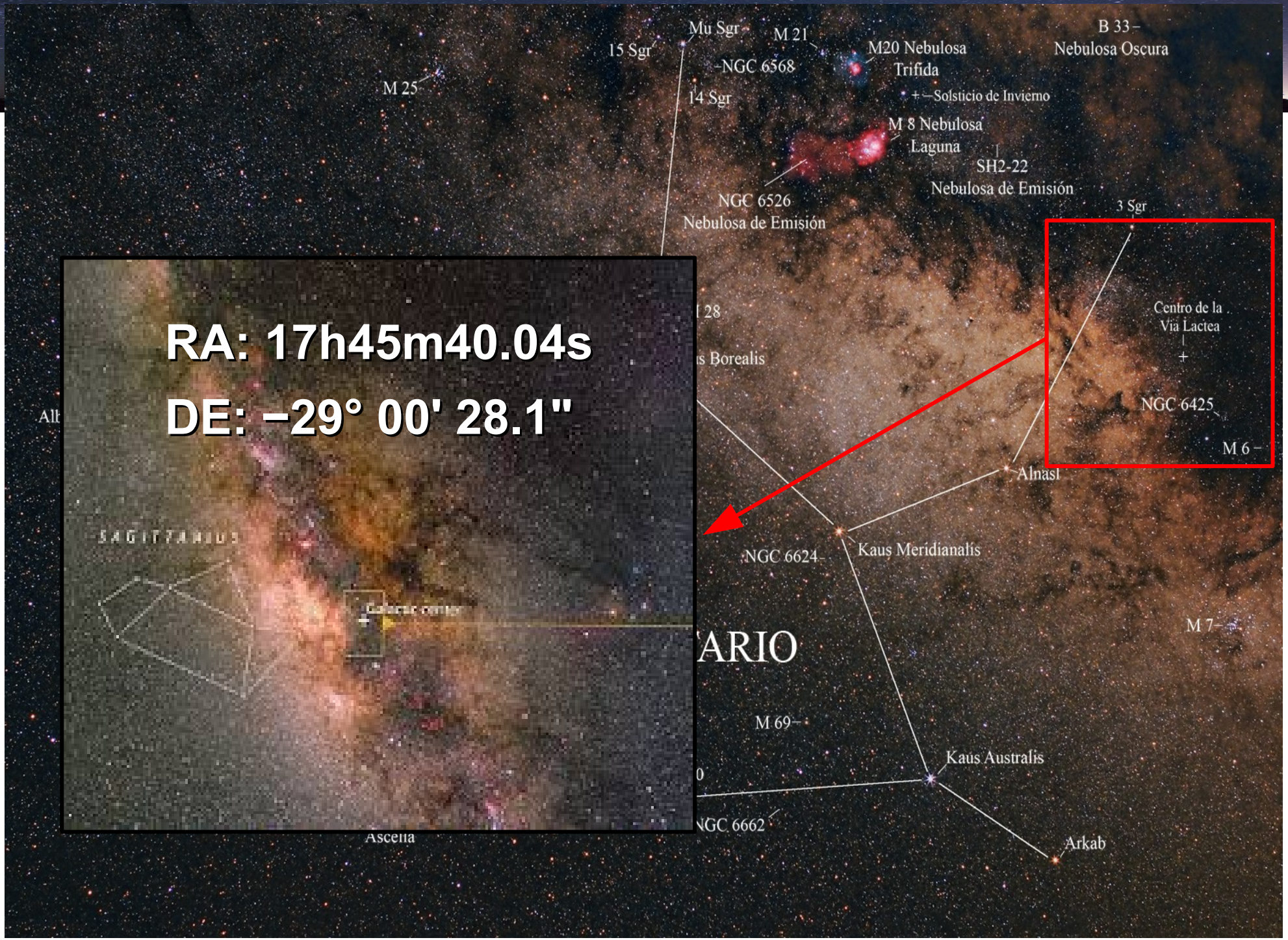
NGC 6425
M 6
Alnasl
Kaus Meridianalis
NGC 6624
M 7
M 69
Kaus Australis
Arkab
Ascella
SAGITTARIUS


RA: 17h45m40.04s
DE: −29° 00' 28.1"
Mu Sgr
M 21
15 Sgr
M20 Nebulosa
Trifida
NGC 6568
B 33
Nebulosa Oscura
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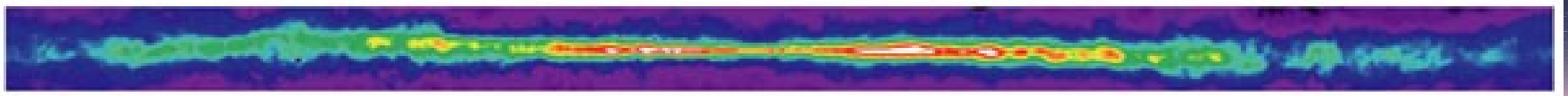
SAGITTARIUS



a 21-cm radio emission from atomic hydrogen gas.

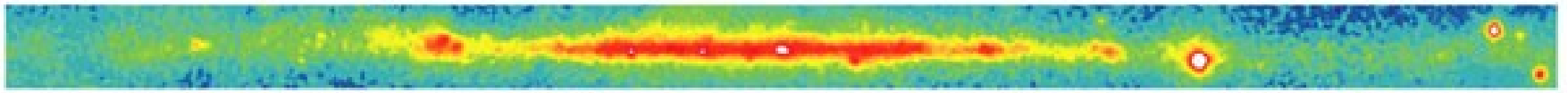
b Radio emission from carbon monoxide reveals molecular clouds.

c Infrared (60–100 μm) emission from interstellar dust.

d Infrared (1–4 μm) emission from stars that penetrates most interstellar material.

e Visible light emitted by stars is scattered and absorbed by dust.

f X-ray emission from hot gas bubbles (diffuse blobs) and X-ray binaries (pointlike sources).



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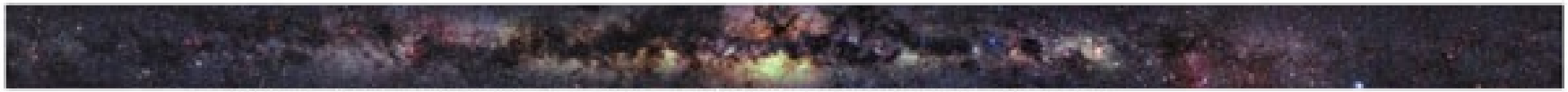

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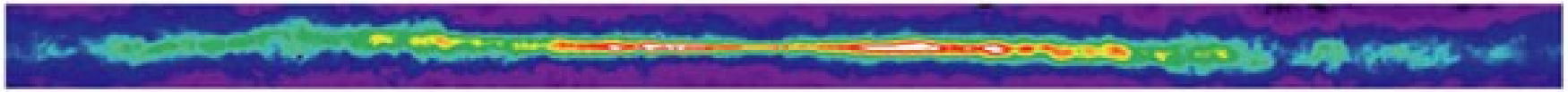

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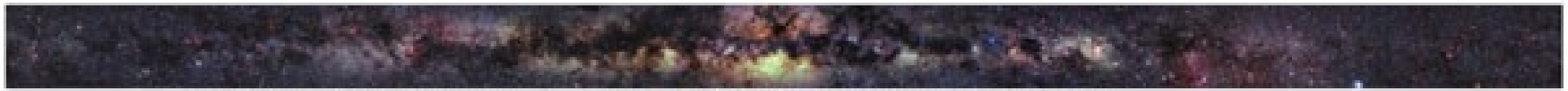

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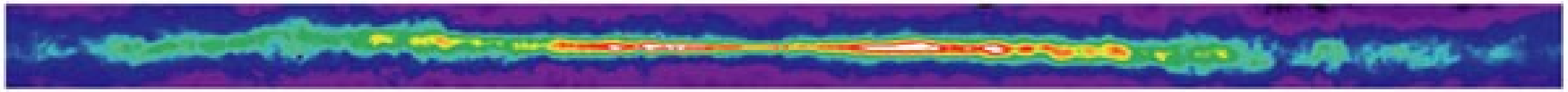

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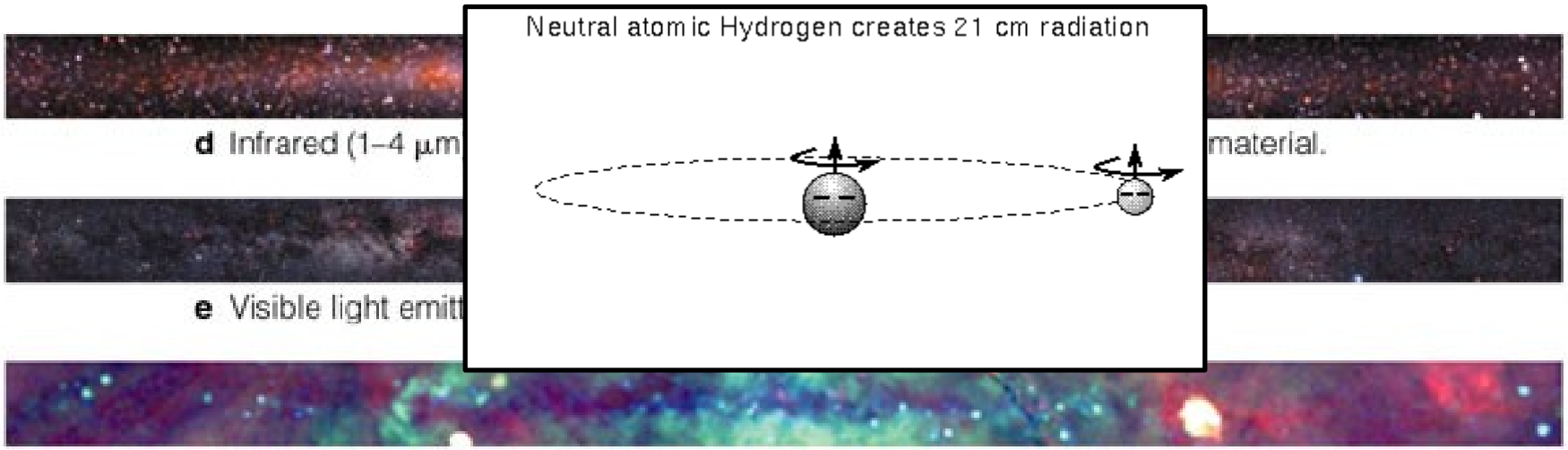

d Infrared (1–4 μm material.

e Visible light emitt

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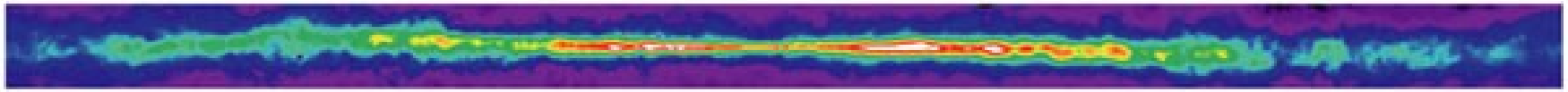

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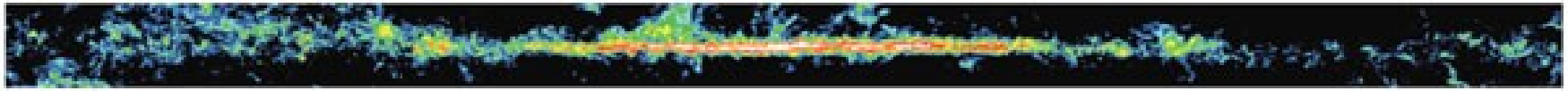

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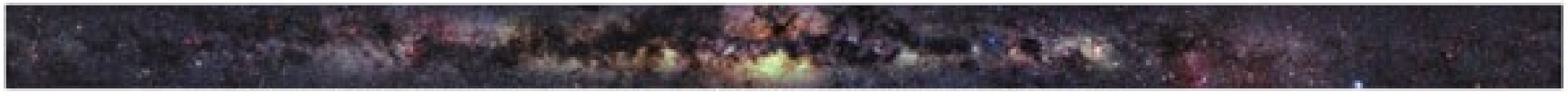

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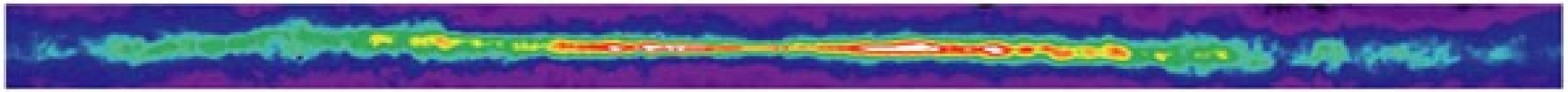

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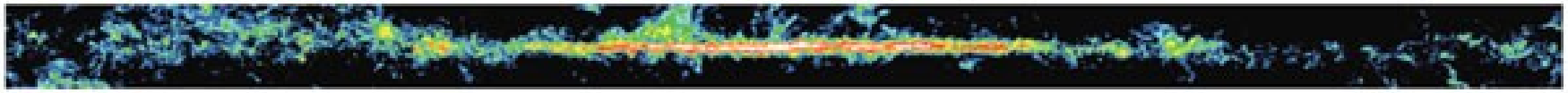

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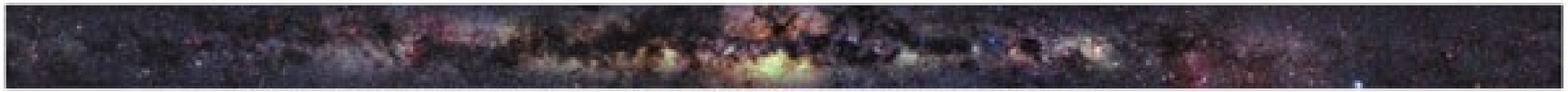

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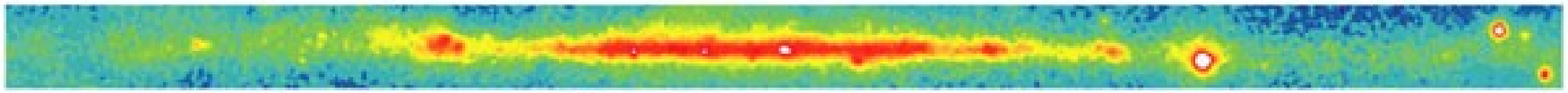

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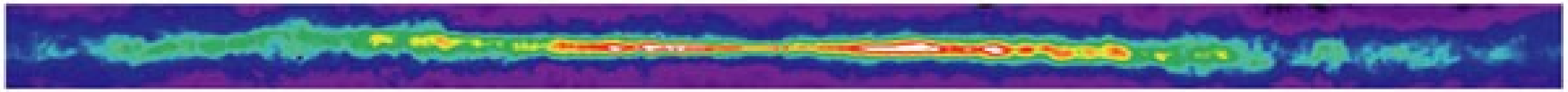

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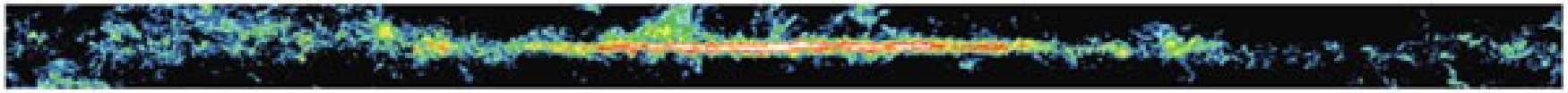

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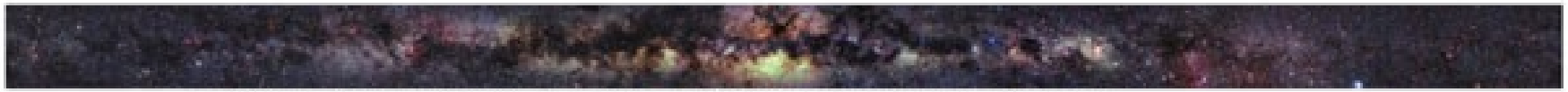

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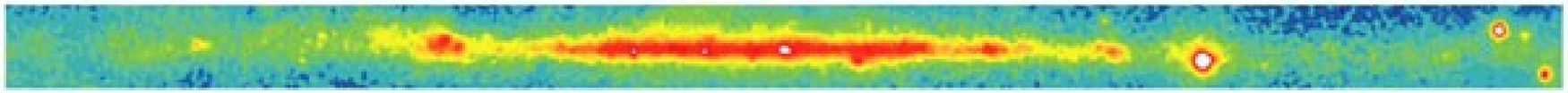

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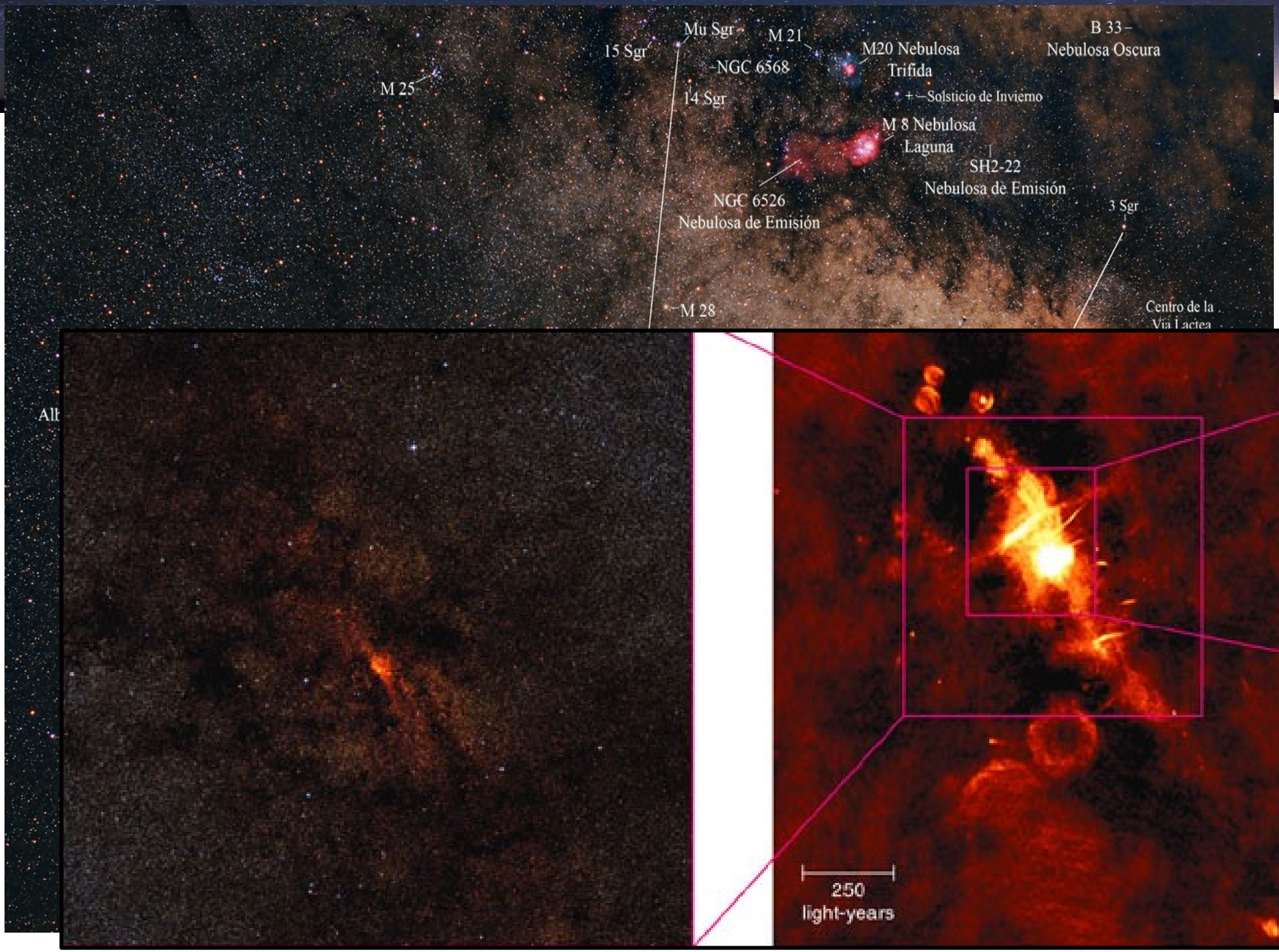
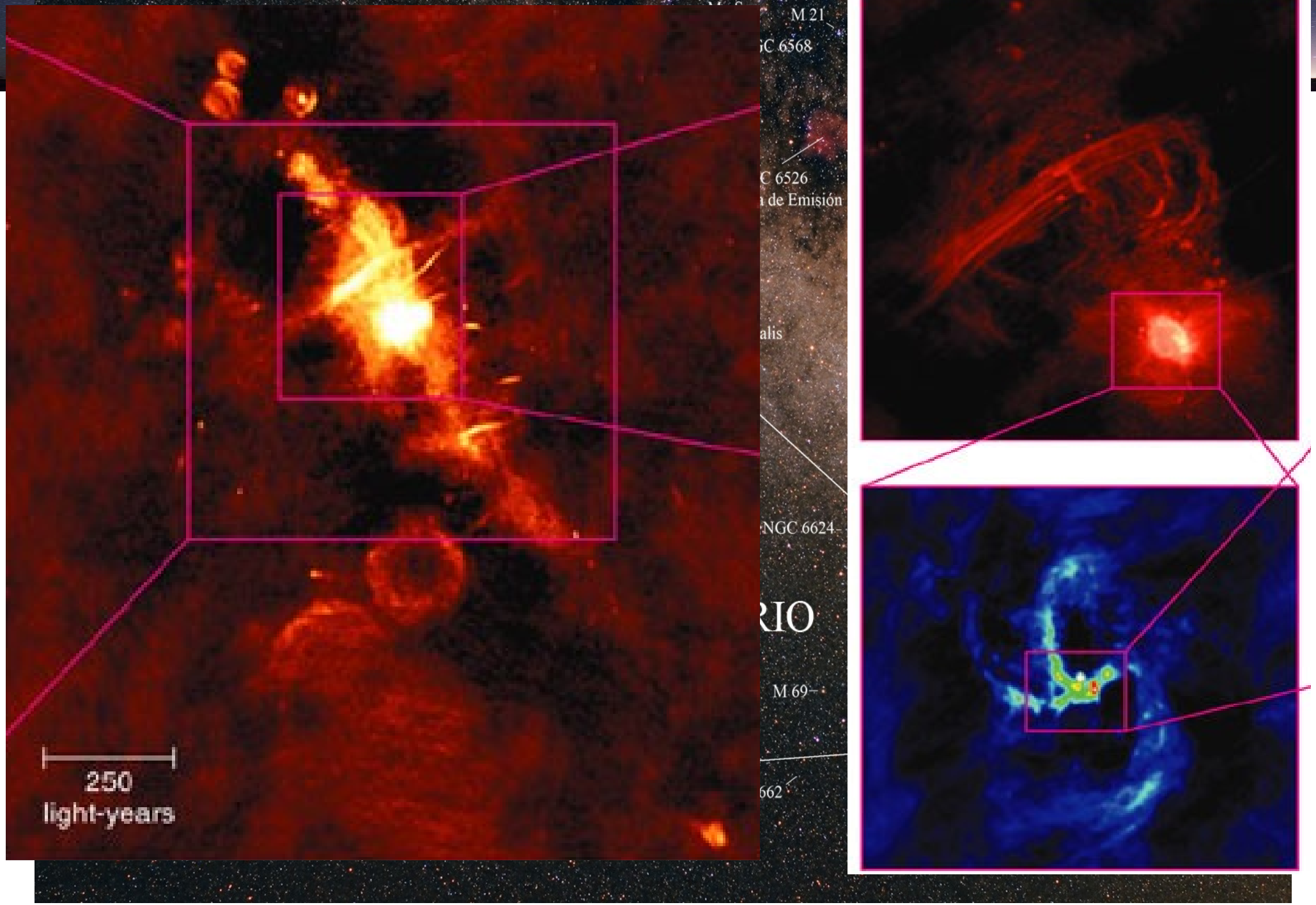
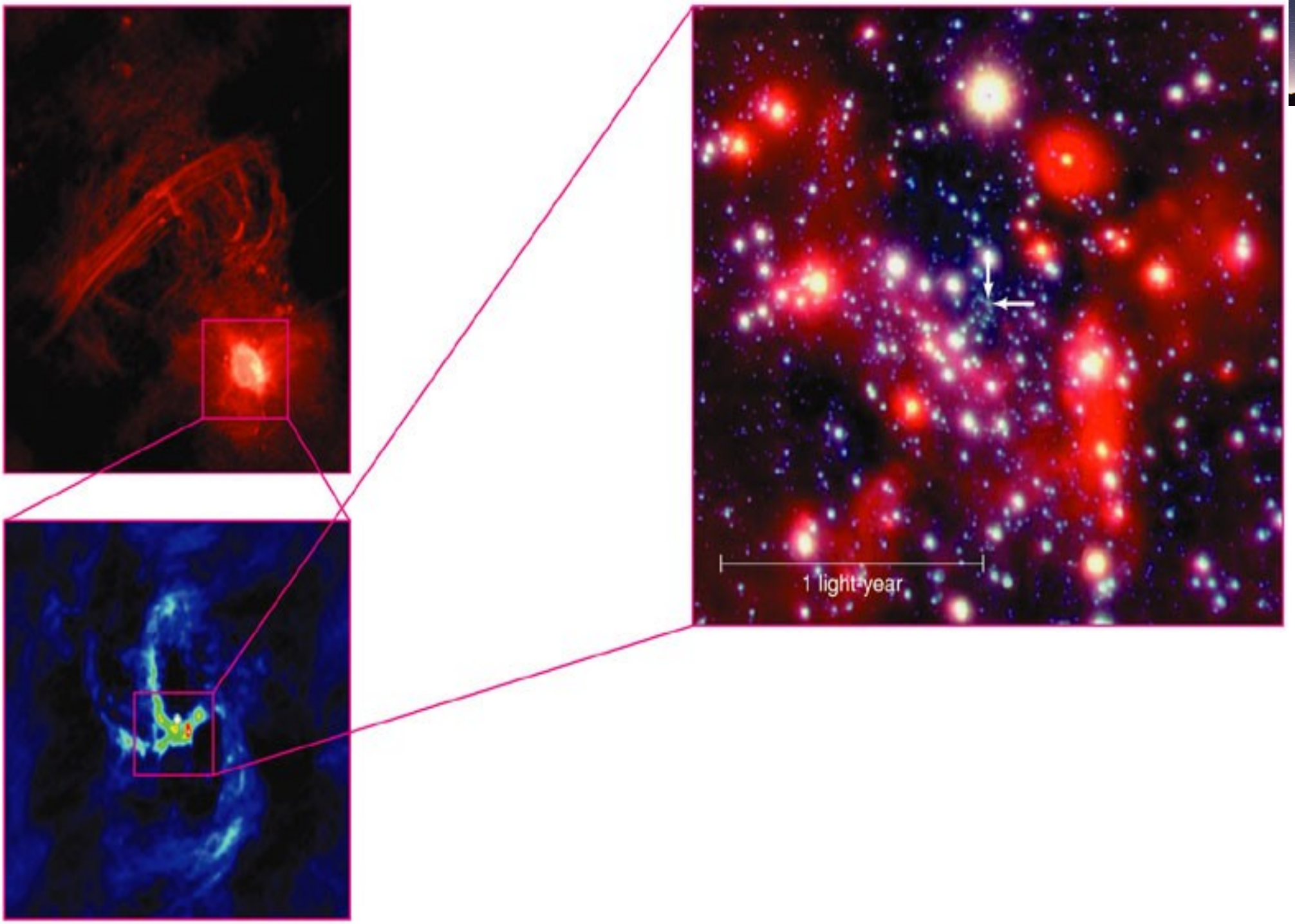
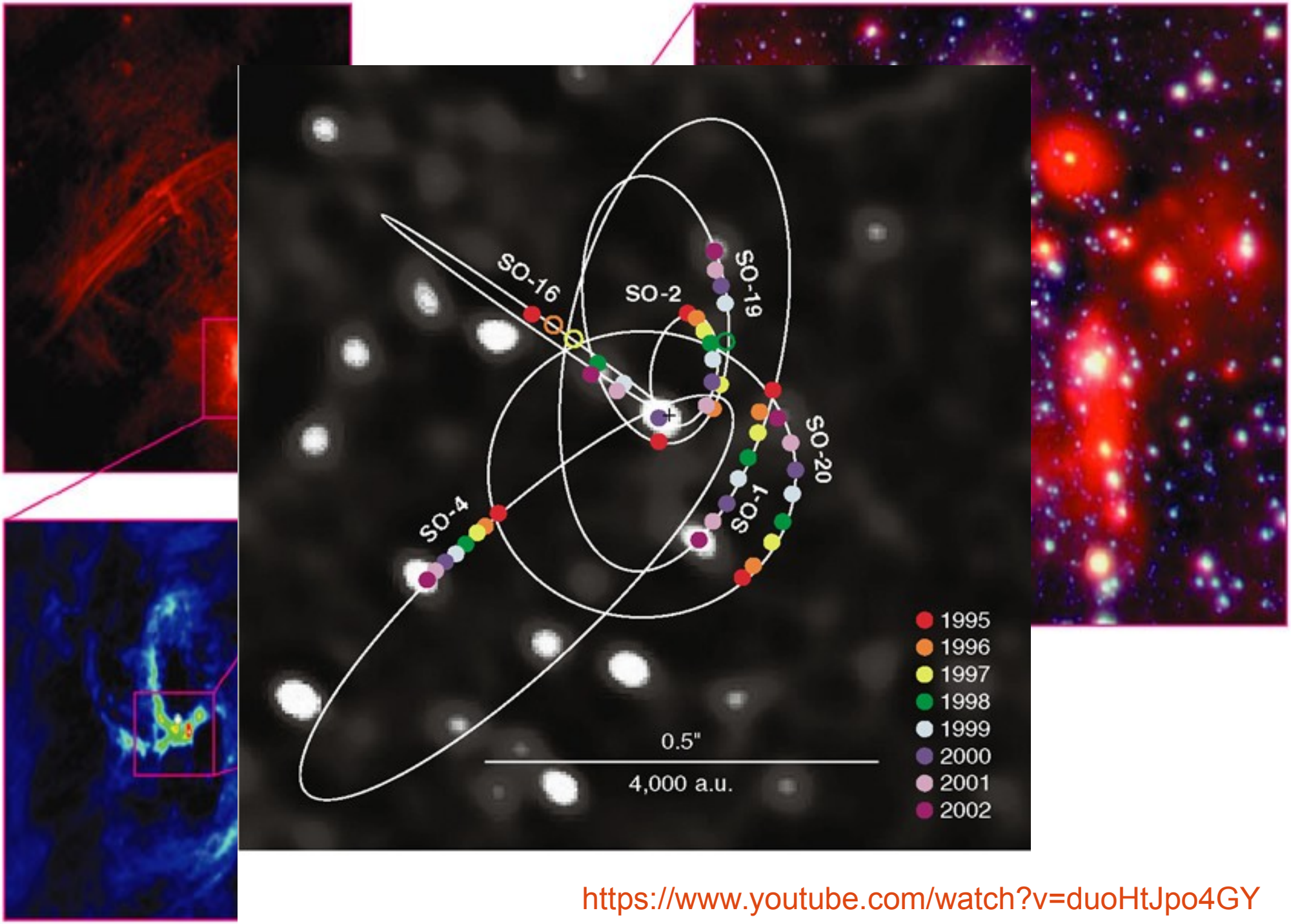
http://en.wikipedia.org/wiki/File:Infrared-visible_light_comparison_of_VISTA's_gigapixel_view_of_the_centre_of_the_Milky_Way.ogv


Mu Sgr
M 21
15 Sgr
M20 Nebulosa
Trifida
B 33 –
Nebulosa Oscura
NGC 6568
M 25
14 Sgr
Solsticio de Invierno
M 8 Nebulosa
Laguna
SH2-22
Nebulosa de Emisión
NGC 6526
Nebulosa de Emisión
3 Sgr
M 28
Centro de la
Vía Láctea
250
light-years

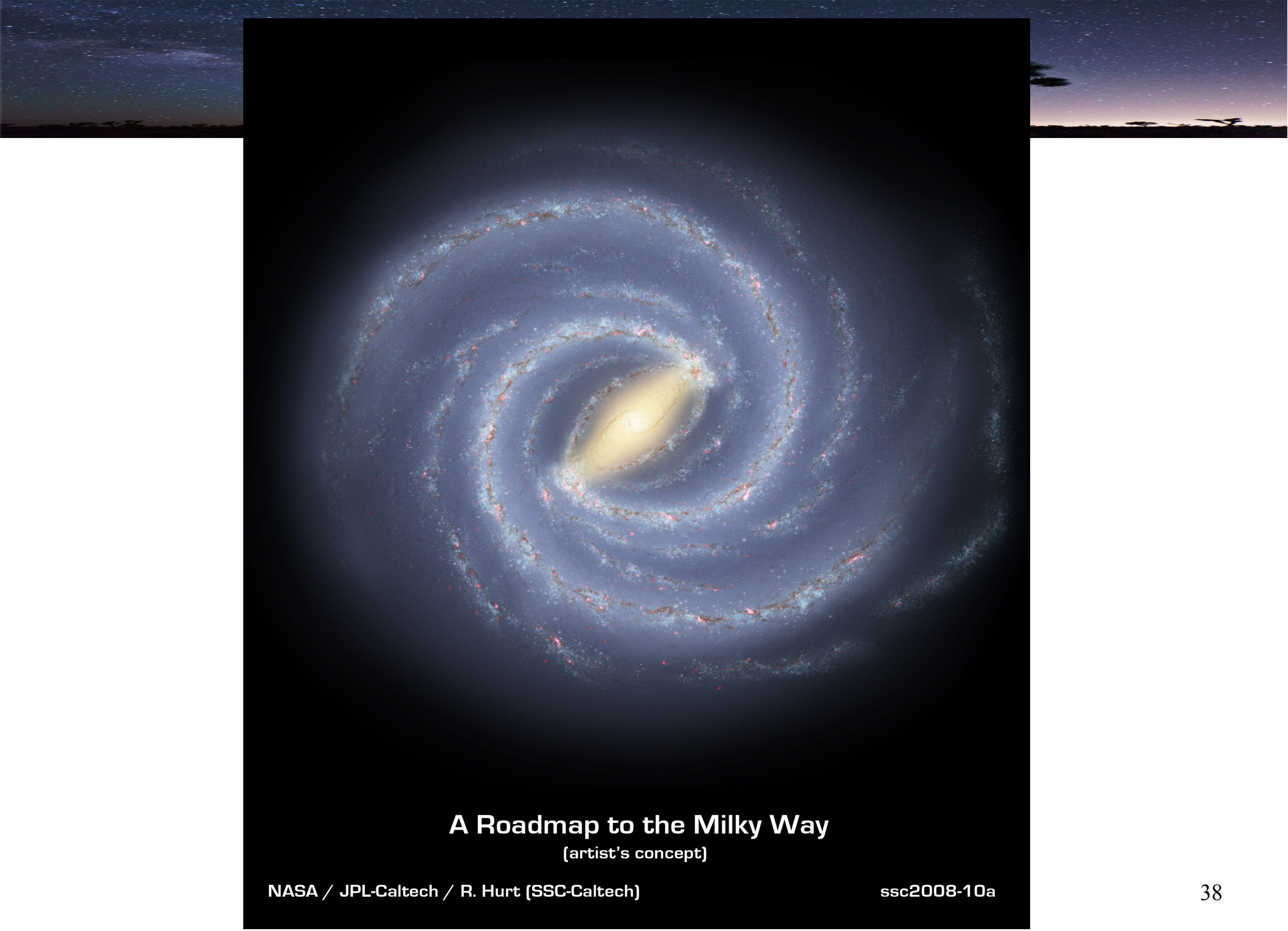

M 21
C 6568
C 6526
de Emisión
alis
NGC 6624
RIO
M 69
662
250
light-years

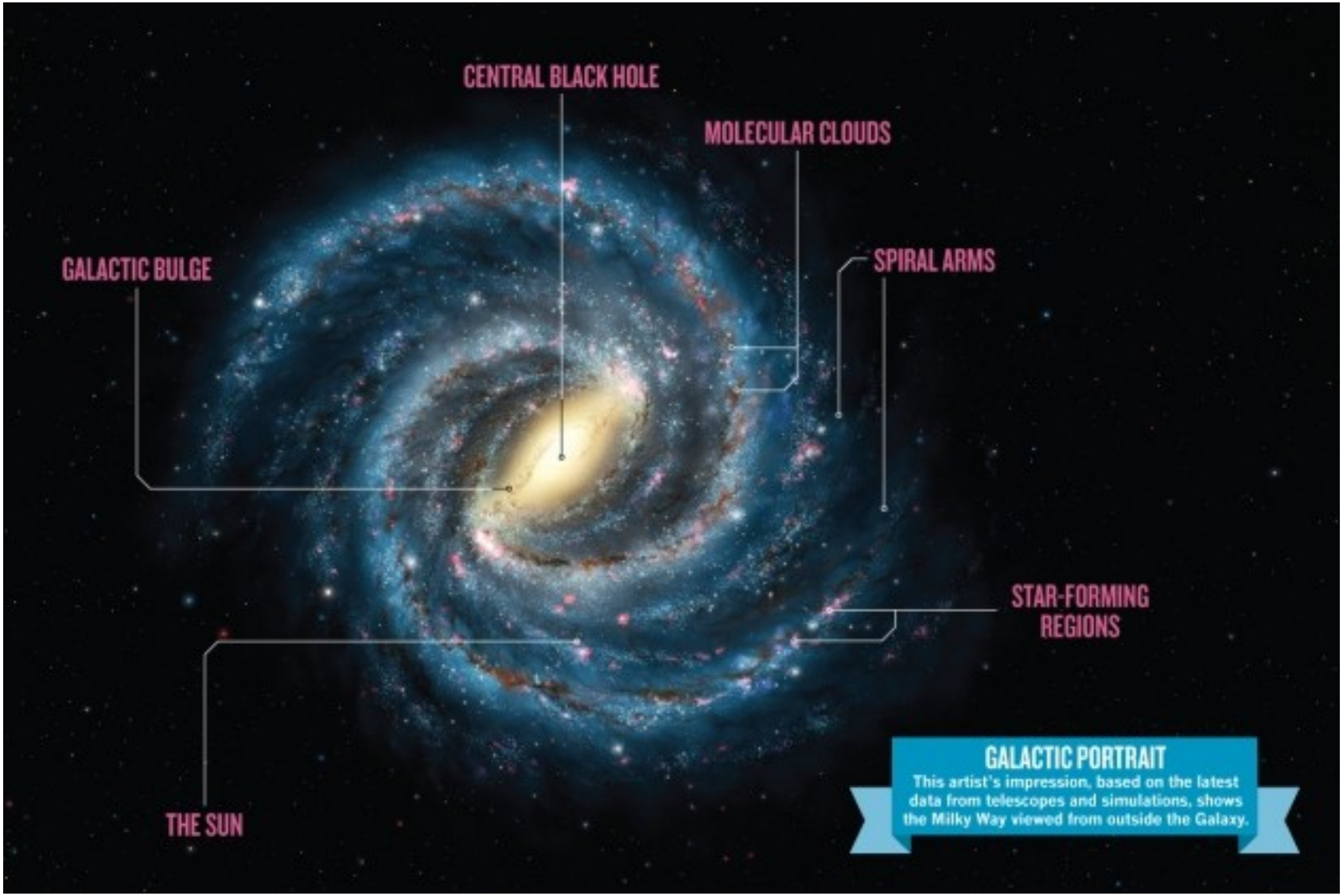

1 light-year



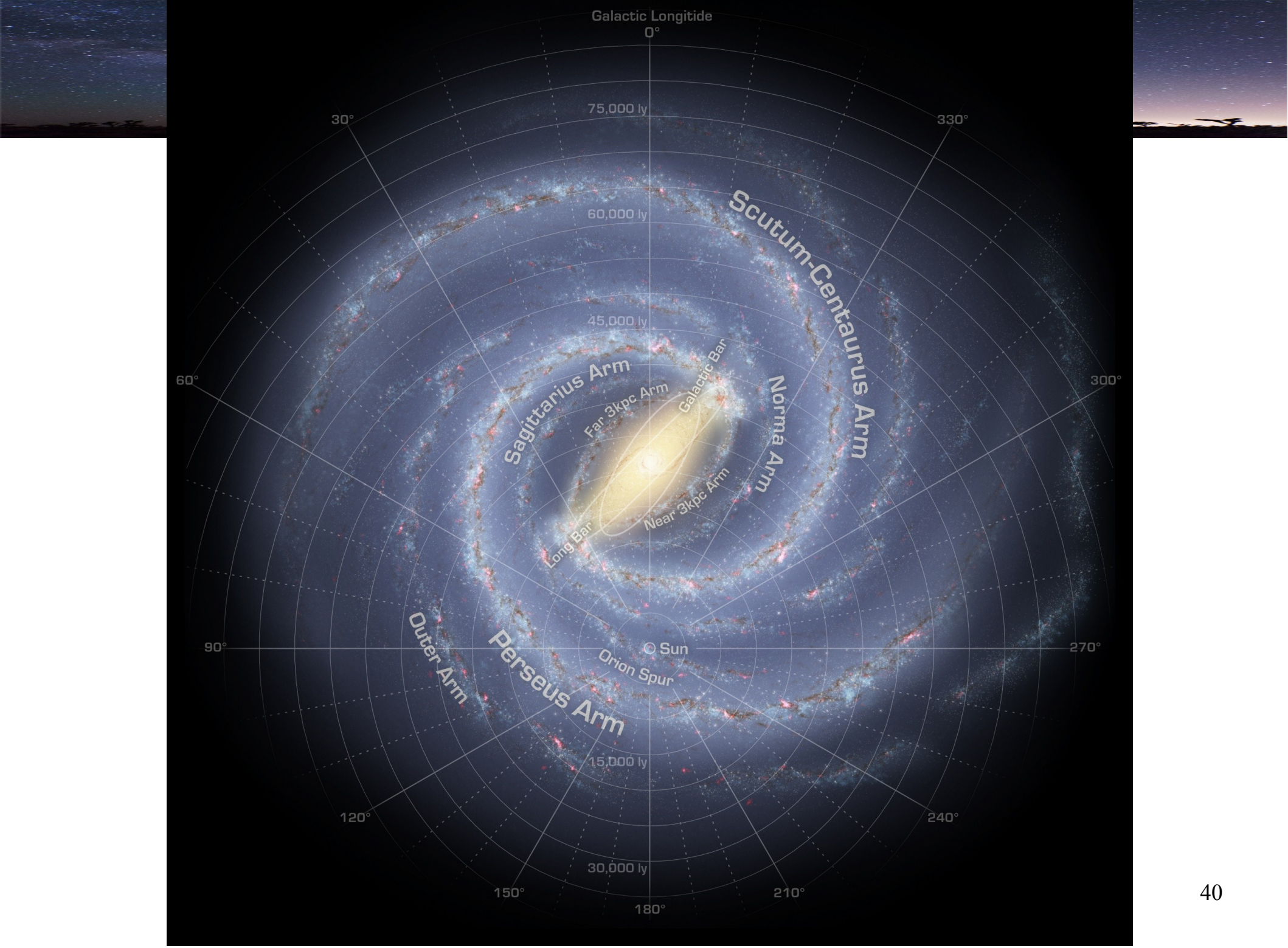
https://www.youtube.com/watch?v=duoHtJpo4GY

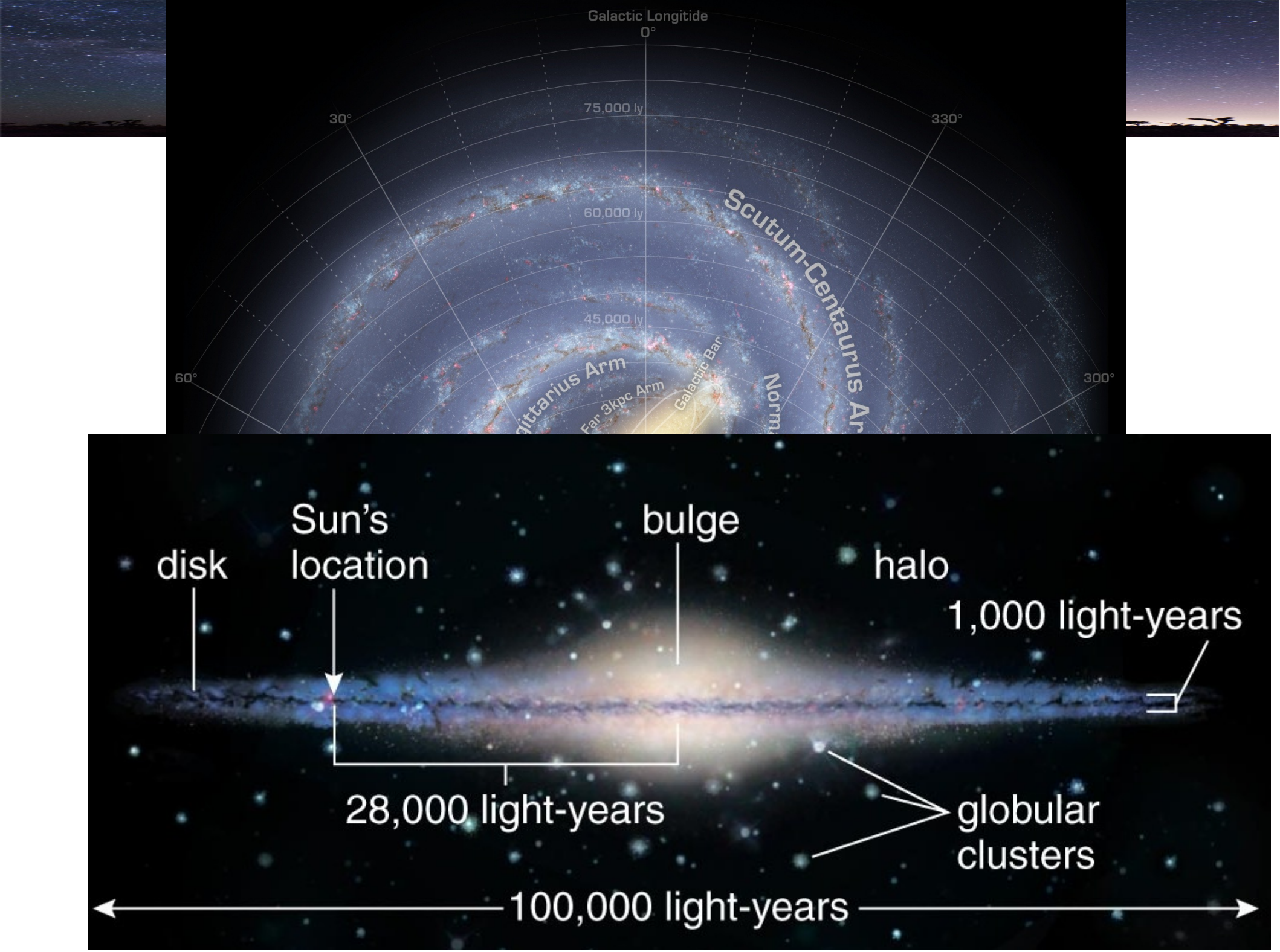
¿Y qué forma tiene nuestra galaxia?

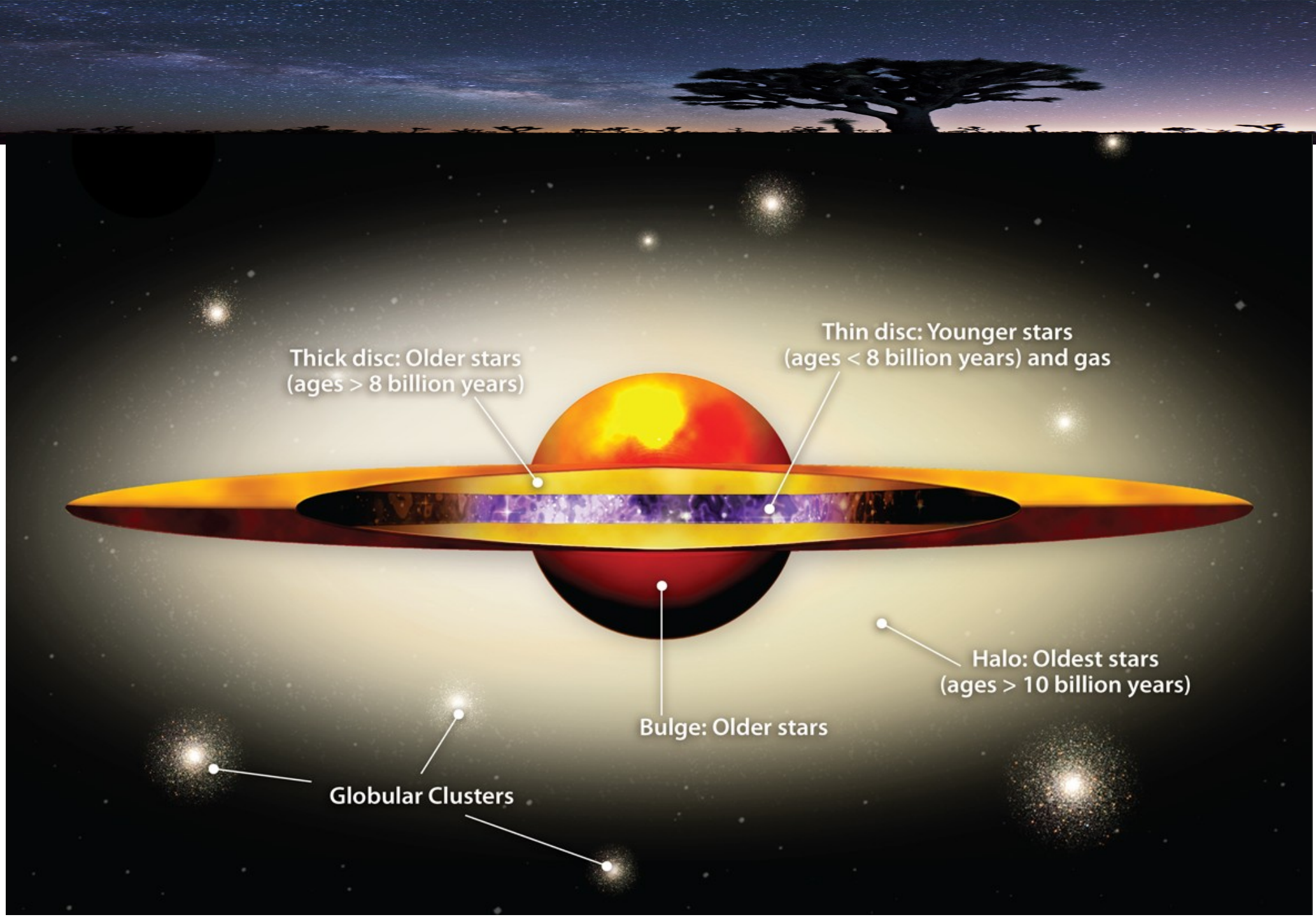

A Roadmap to the Milky Way
(artist's concept)
NASA / JPL-Caltech / R. Hurt (SSC-Caltech)
ssc2008-10a

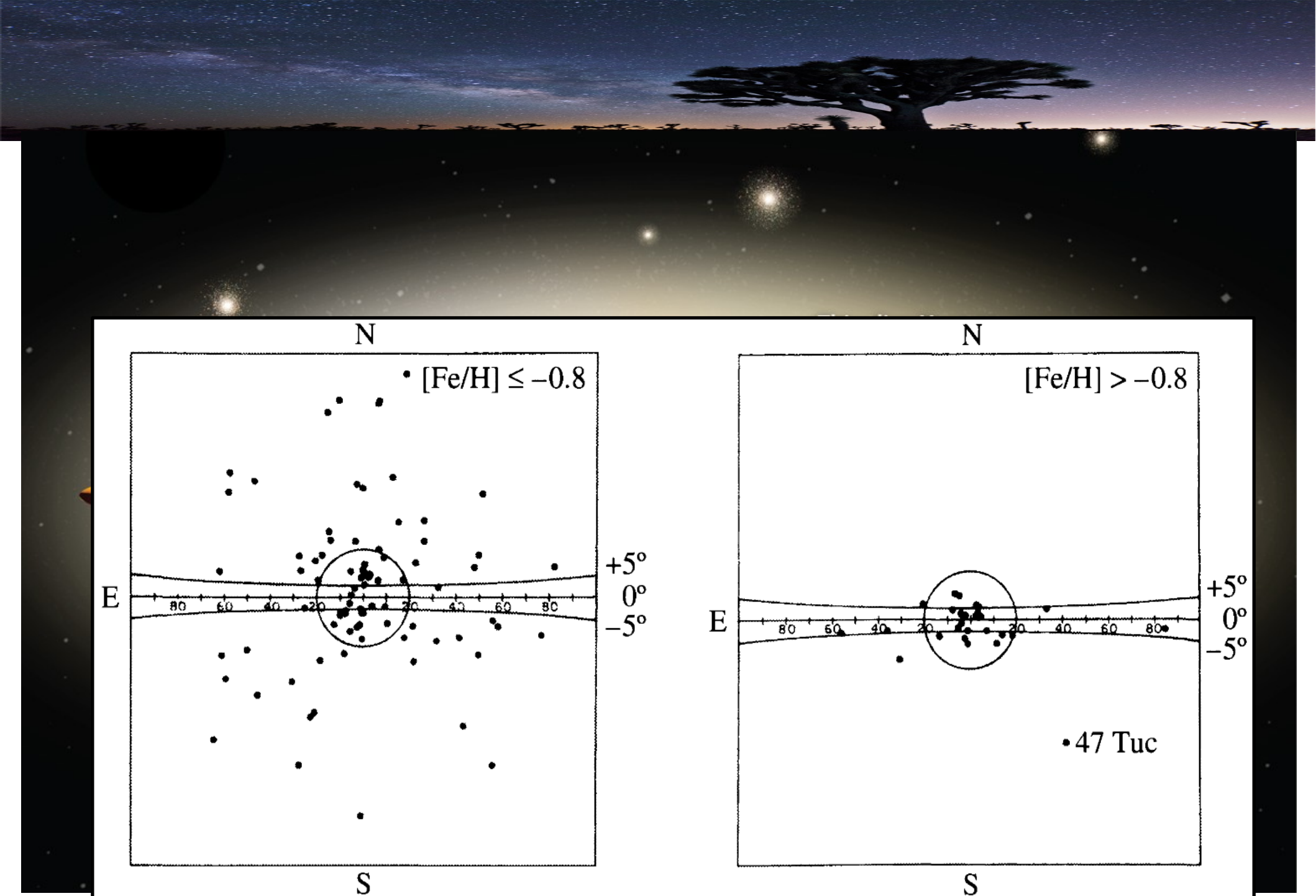


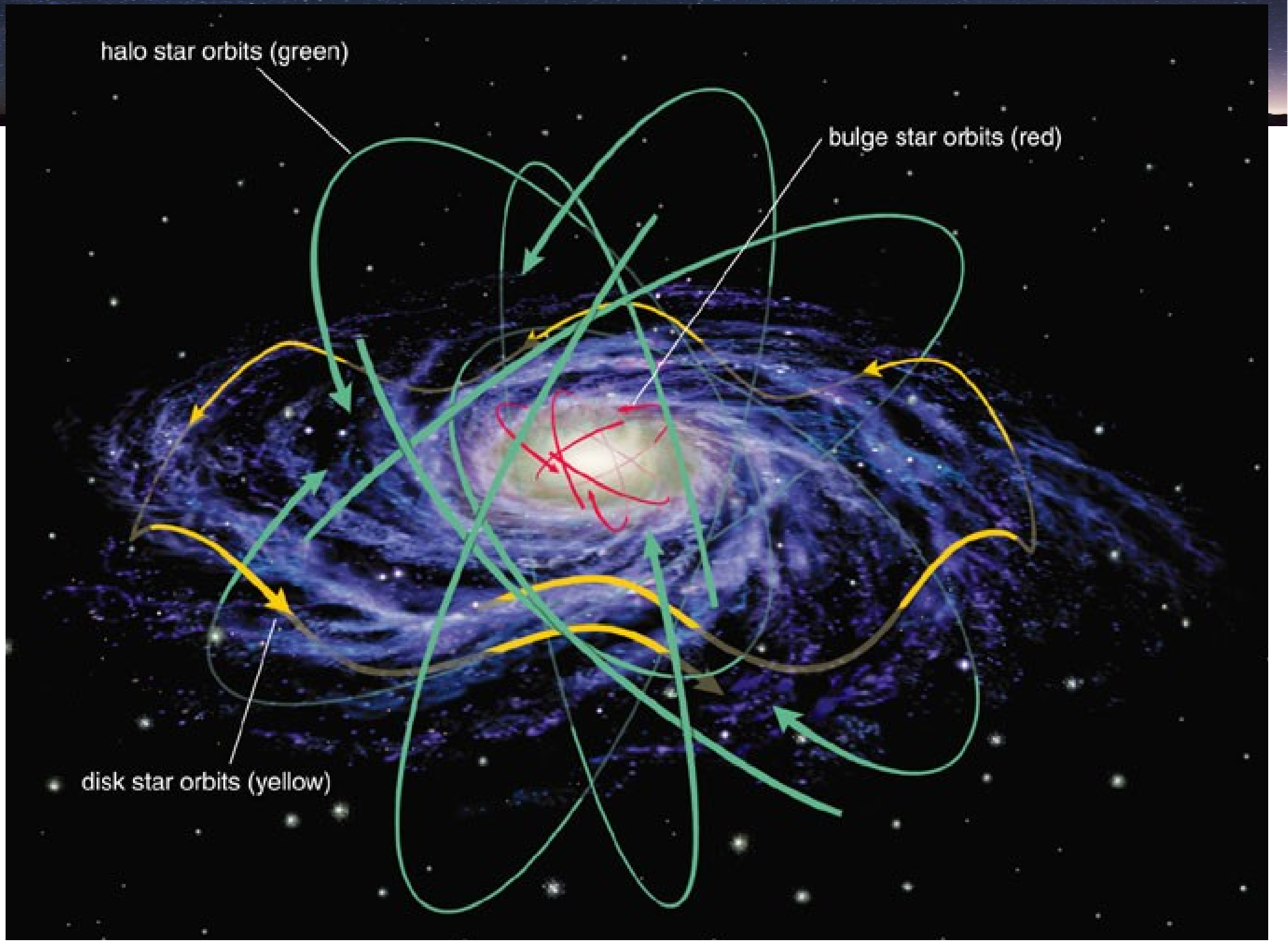
http://www.nature.com/news/galaxy-formation-the-new-milky-way-1.11517#/mw1

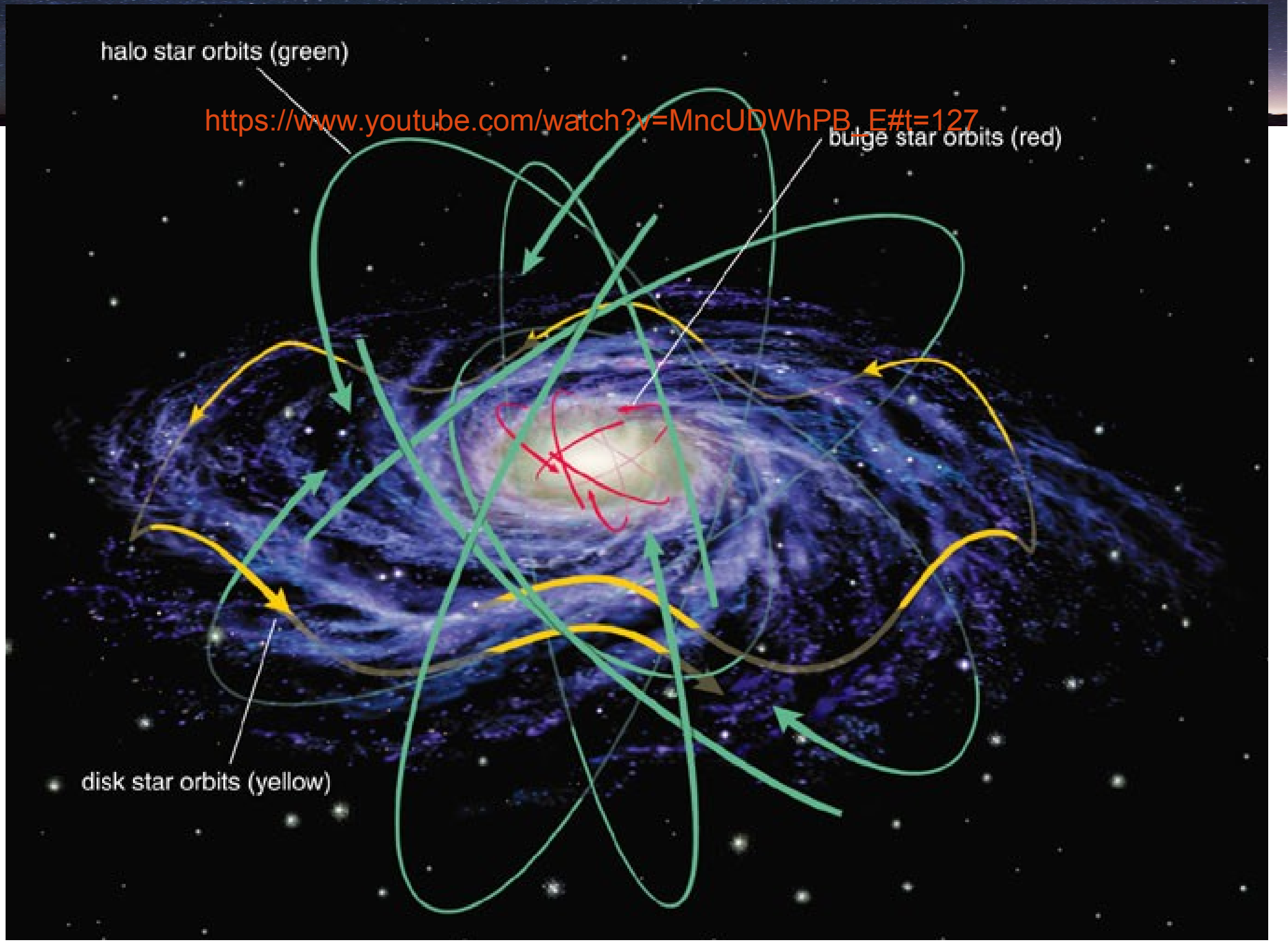

Galactic Longitide
0°
30°
330°
60°
300°
90°
270°
120°
240°
150°
210°
180°
75,000 ly
60,000 ly
45,000 ly
30,000 ly
15,000 ly
Scutum-Centaurus Arm
Sagittarius Arm
Norma Arm
Perseus Arm
Outer Arm
Far 3kpc Arm
Galactic Bar
Near 3kpc Arm
Long Bar
Sun
Orion Spur


Galactic Longitide
0°
30°
330°
75,000 ly
60,000 ly
45,000 ly
60°
300°
Scutum-Centaurus Ar
Sagittarius Arm
Far 3kpc Arm
Galactic Bar
Norm
disk
Sun's location
bulge
halo
1,000 light-years
28,000 light-years
globular clusters
100,000 light-years


Thick disc: Older stars
(ages > 8 billion years)
Thin disc: Younger stars
(ages < 8 billion years) and gas
Halo: Oldest stars
(ages > 10 billion years)
Bulge: Older stars
Globular Clusters


N
• [Fe/H] ≤ –0.8
+5°
0°
–5°
E
80
60
40
20
20
40
60
80
S
N
[Fe/H] > –0.8
+5°
0°
–5°
E
80
60
40
20
20
40
60
80
• 47 Tuc
S


halo star orbits (green)
bulge star orbits (red)
disk star orbits (yellow)


halo star orbits (green)
https://www.youtube.com/watch?v=MncUDWhPB_E#t=127
bulge star orbits (red)
disk star orbits (yellow)

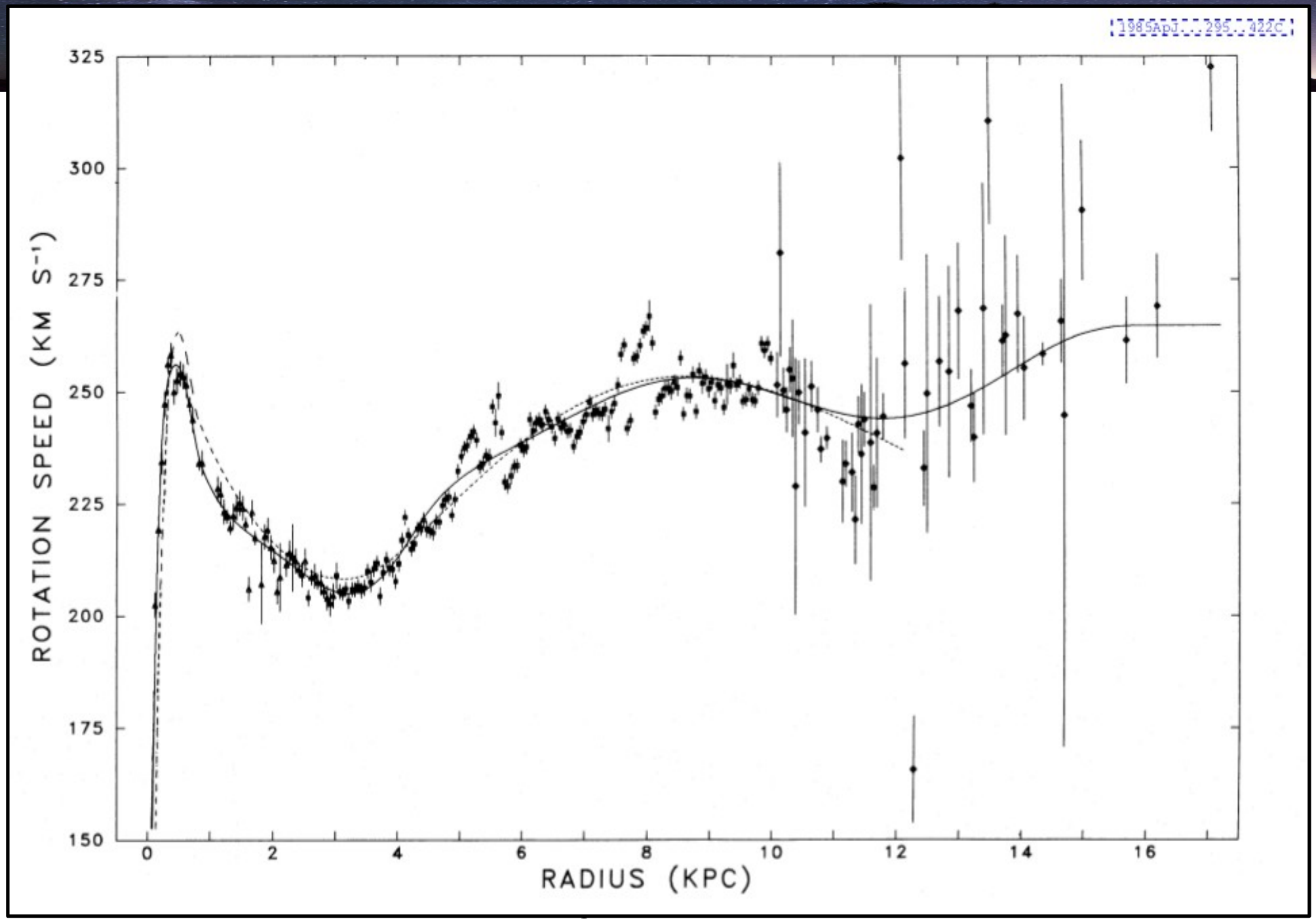
Materia Oscura

/media/now/Physics/docencia/astronomia2013-II/lasclases/rotation_of_solar_system.htm

Materia Oscura

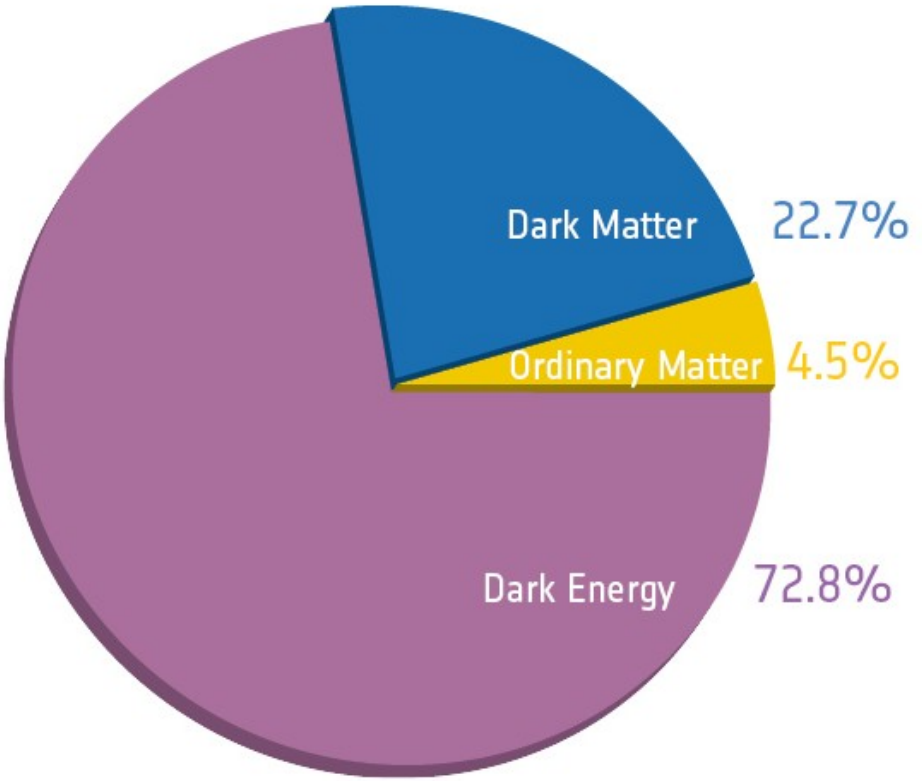
/media/now/Physics/docencia/astronomia2013-II/lasclases/rotation_of_solar_system.htm

/media/now/Physics/docencia/astronomia2013-II/lasclases/rotation_of_spiral_galaxy.htm

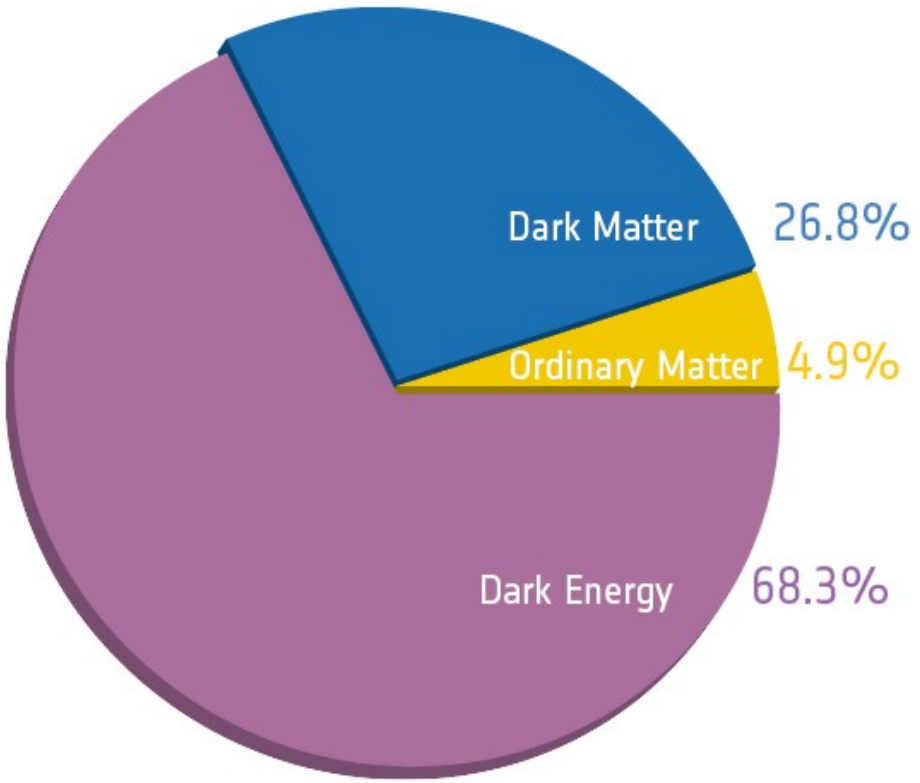

1985ApJ...295..422C
325
300
275
250
225
200
175
150
ROTATION SPEED (KM S-1)
0
2
4
6
8
10
12
14
16
RADIUS (KPC)

Misión Planck

Misión Planck

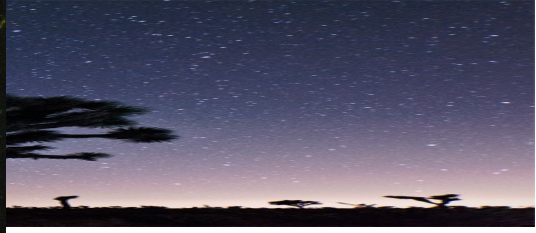


Before Planck

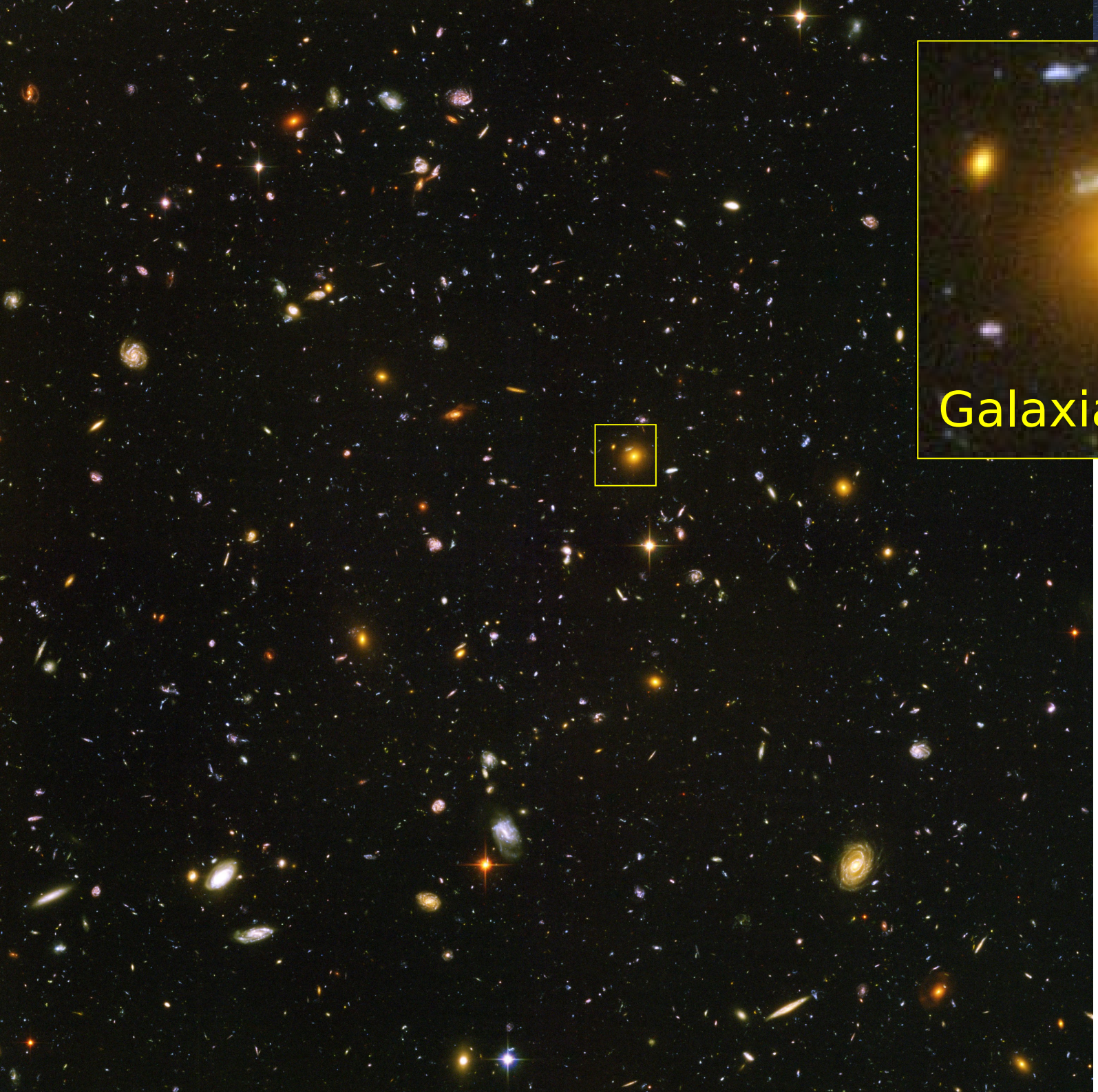


After Planck

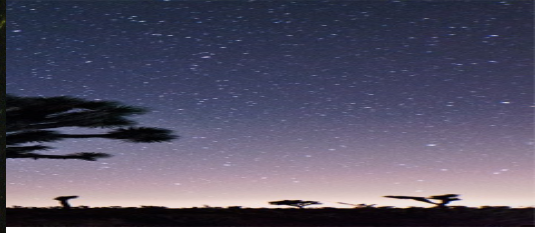
Clasificación Galáctica



a



Galaxia Eliptica



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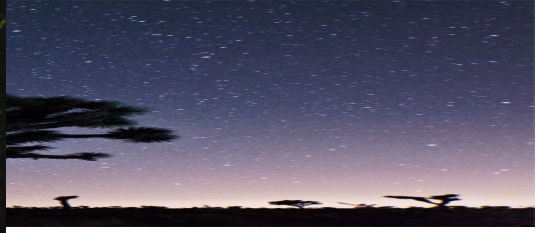

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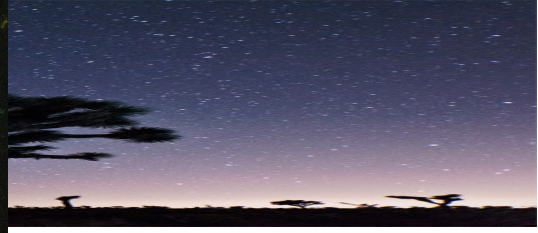

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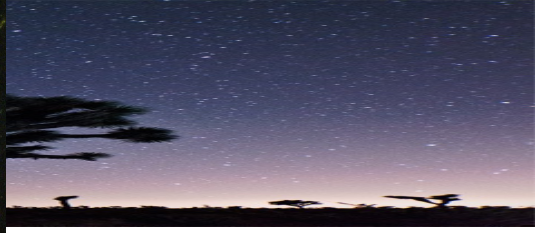

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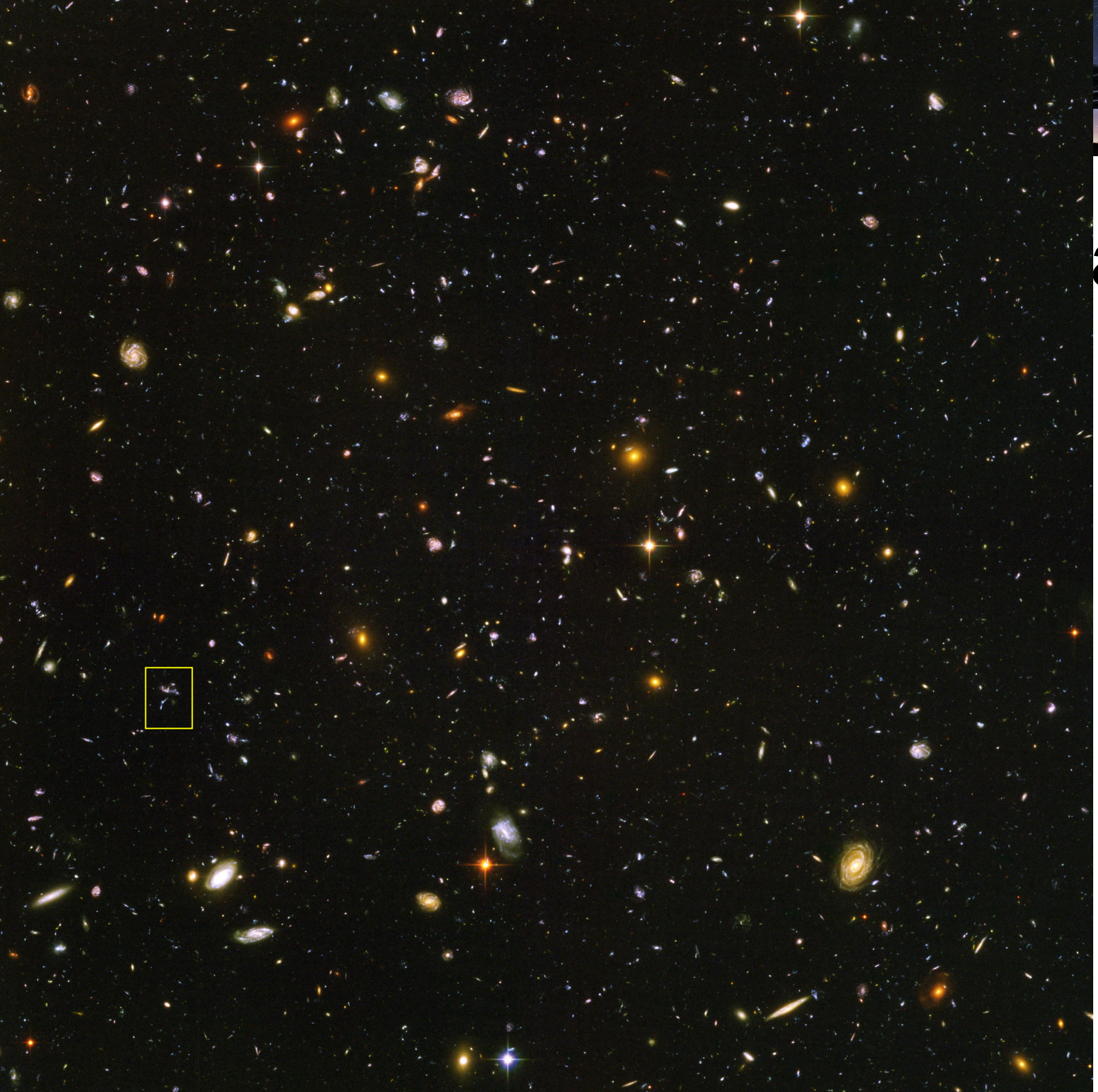

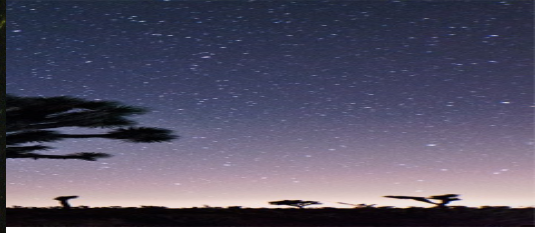

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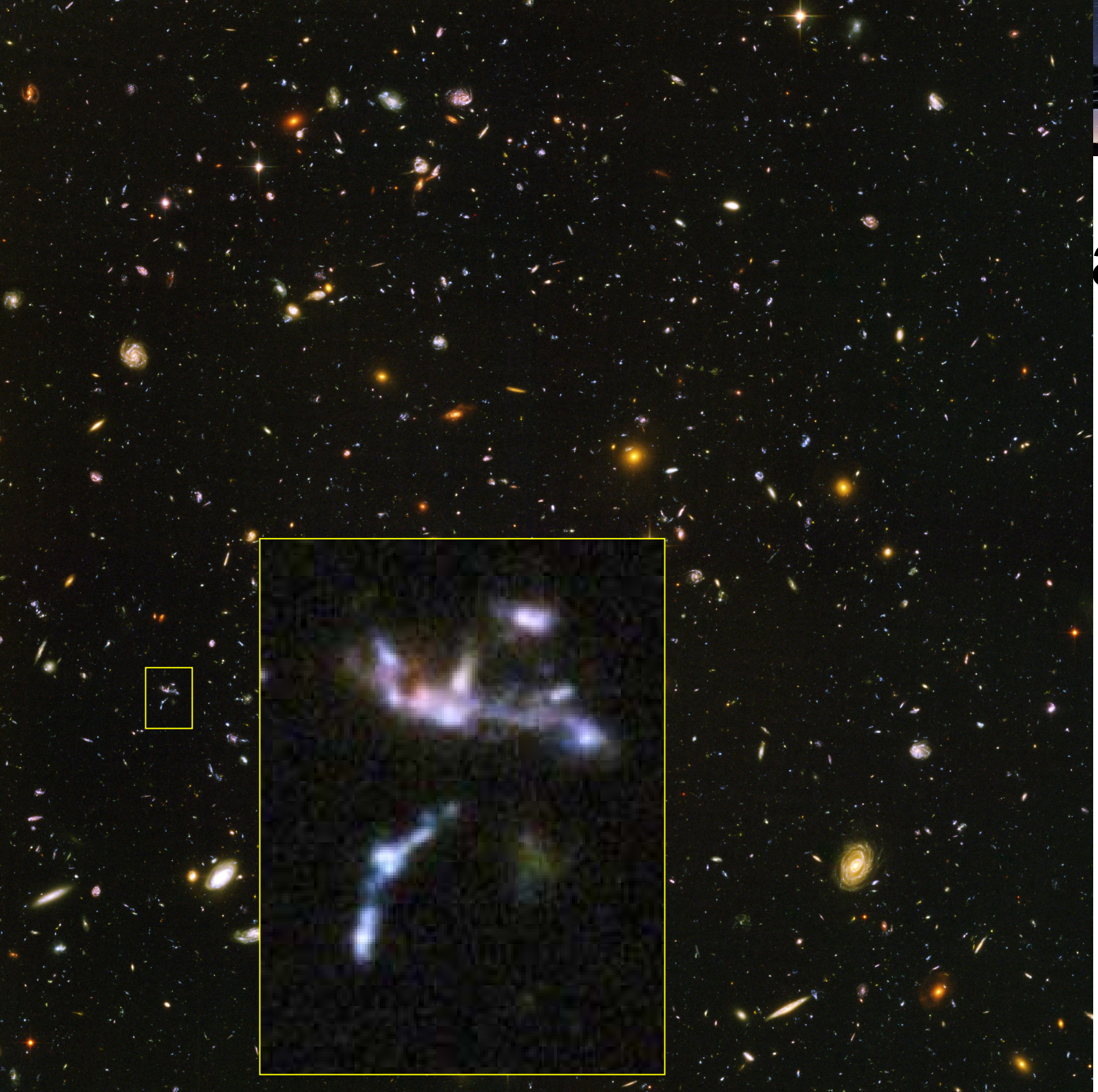
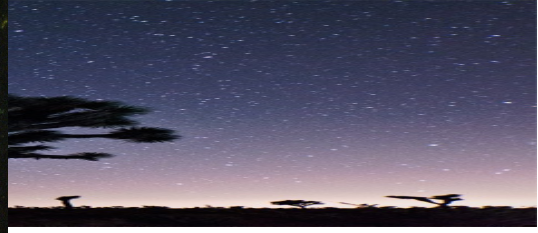




a

Clasificación Galáctica

Clasificación Galáctica

Clasificación Galáctica

Clasificación Galáctica

Clasificación Galáctica

Clasificación Galáctica

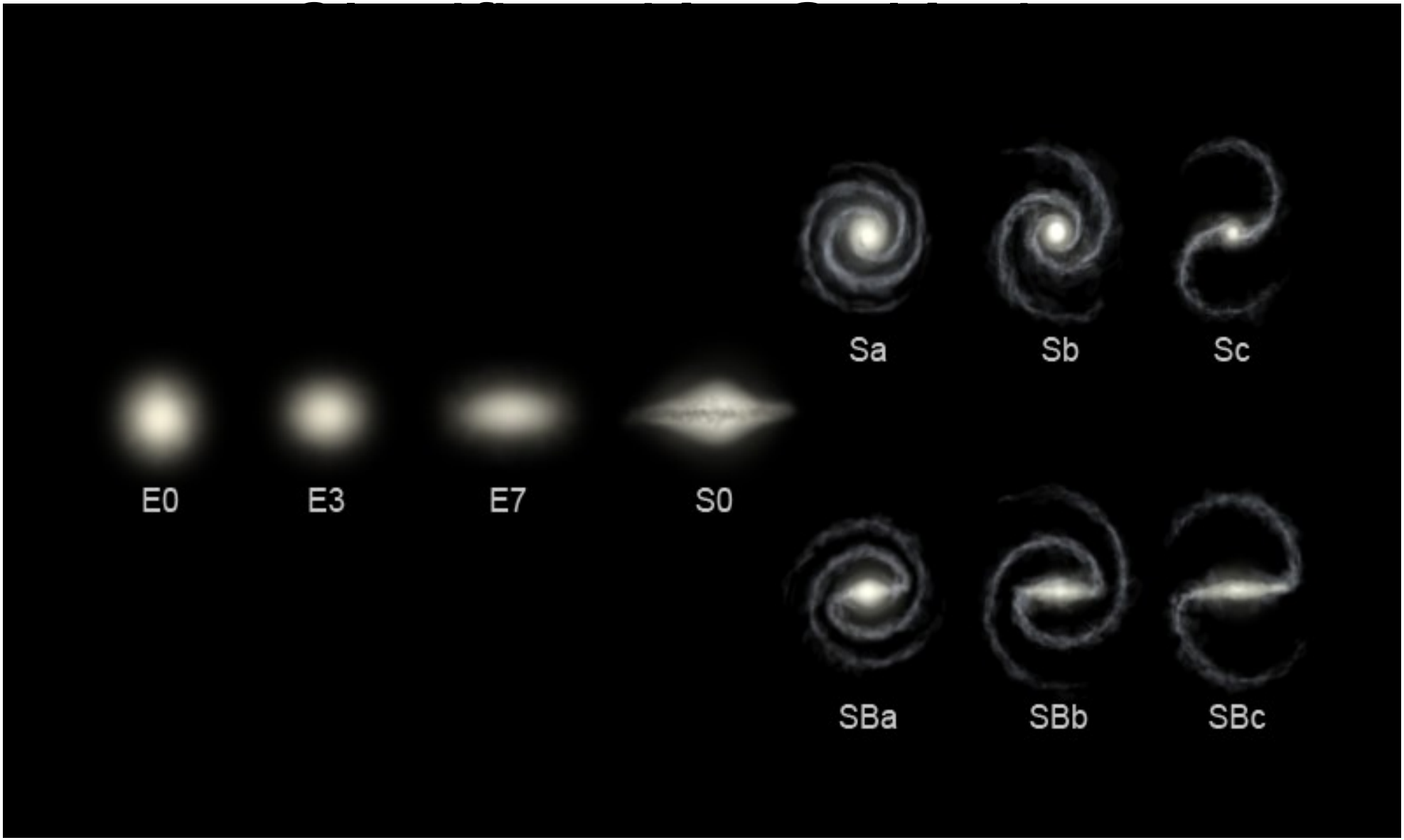
Clasificación Galáctica

https://www.youtube.com/watch?v=D-0GaBQ494E

Clasificación Galáctica

Clasificación Galáctica


Happy First
Birthday
Galaxy Zoo!


Sa
Sb
Sc
E0
E3
E7
S0
SBa
SBb
SBc