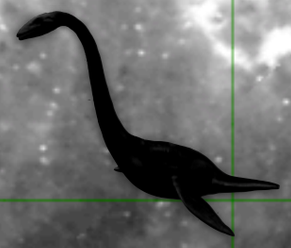
The Bones of the Milky Way



Alyssa A. Goodman (Harvard-Smithsonian Center for Astrophysics)

with collaborators at (alphabetically by insitution):

Boston University: James Jackson

Caltech: Jens Kauffmann

Harvard - Smithsonian: Christopher Beaumont, Michelle A. Borkin, Thomas M. Dame

Max Planck Insitute for Astronomy: Thomas Robitaille

U. Munich: Andreas Burkert

U. Vienna: Joao F. Alves

U. Wisconsin: Robert A. Benjamin

Sea Monster to Skeletal Shadow

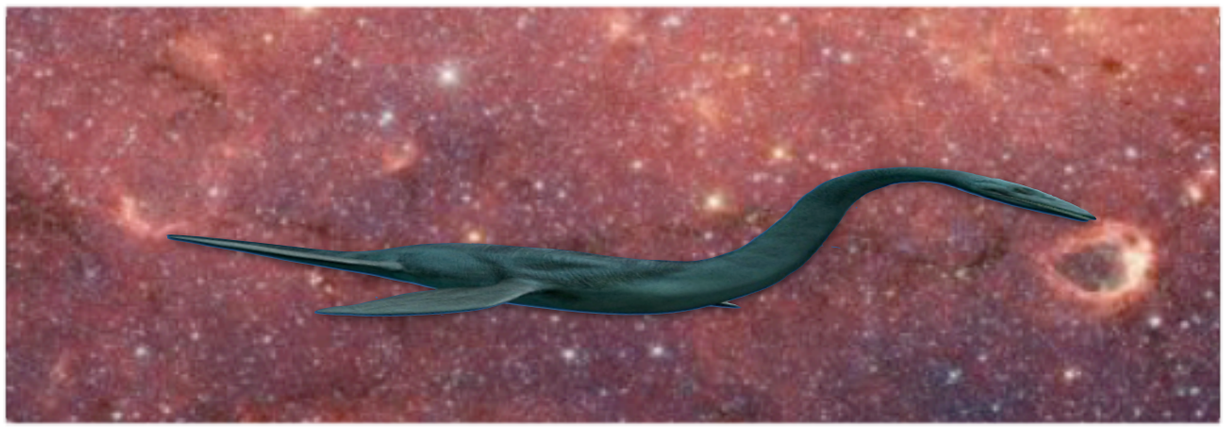
Spitzer GLIMPSE Image

Peculiar dust cloud named “Nessie” much larger than thought.

Nessie more important as “bone” than sea monster.

Sun’s height above Plane may make full Milky Way skeleton mappable.

Who, What, and Where is "Nessie"?



"Is Nessie Parallel to the Galactic Plane?"

Alyssa Goodman, Harvard-Smithsonian CfA, The Bones of the Milky Way, milkywaybones.org

The Milky Way

The Milky Way
(Artist's Conception)

Who, What, and Where is "Nessie"?

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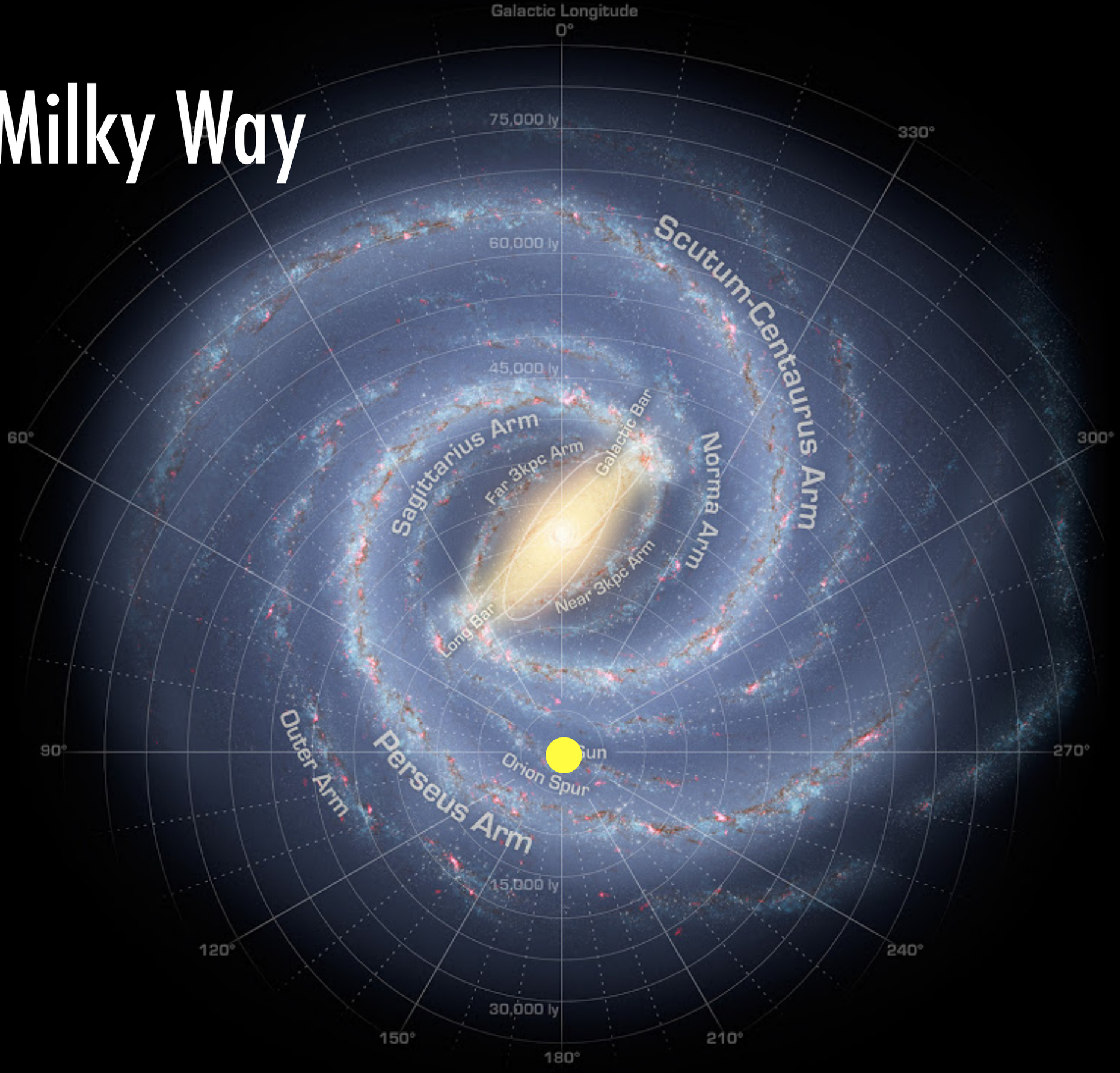
The Milky Way



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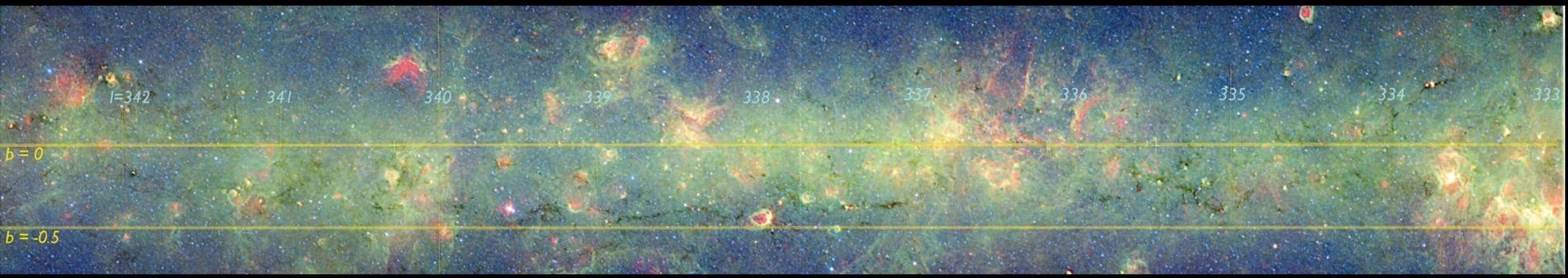

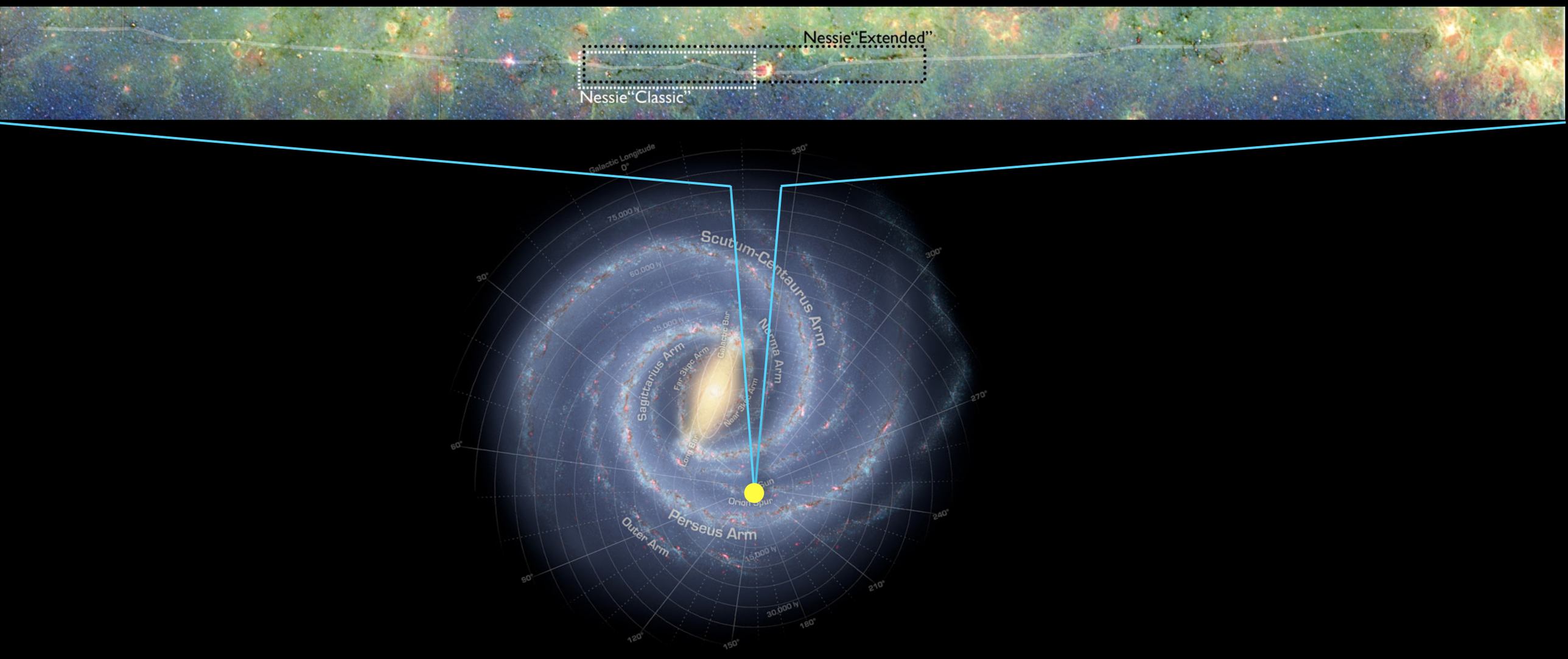

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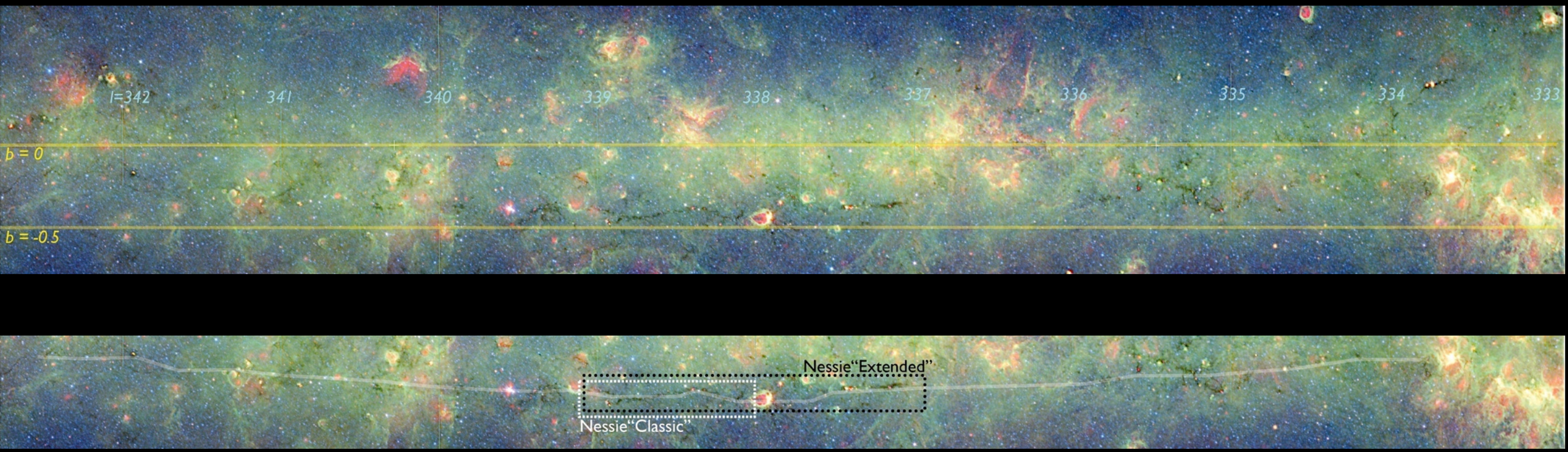


Just "Nessie Extended"...

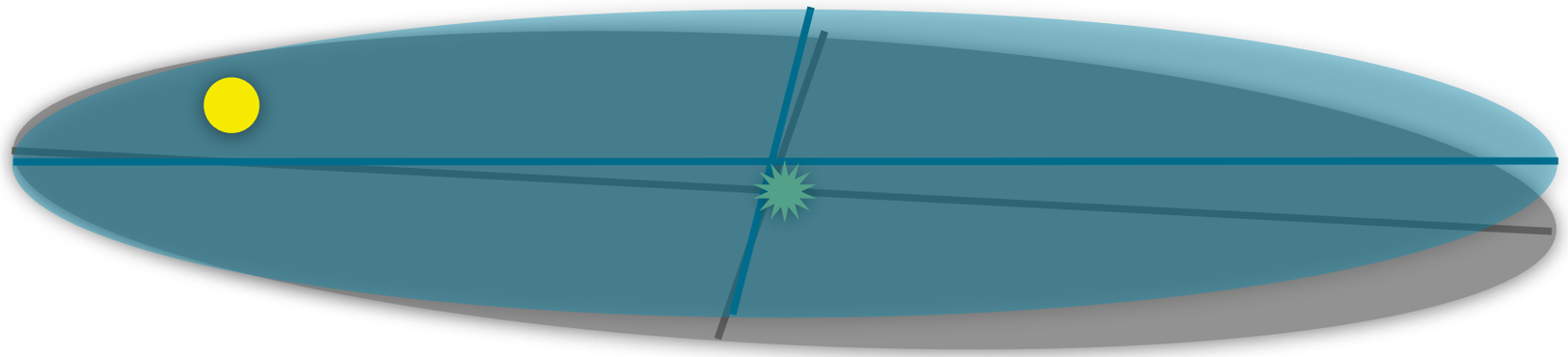
~500 light years long & 1.5 light years thick.

300:1 axial ratio.

Why is it 0.5 degrees below b=0? Is it in the plane, or not?

Where are we?

"IAU Milky Way", est. 1959



True Milky Way, modern

The equatorial plane of the new co-ordinate system must of necessity pass through the sun. It is a fortunate circumstance that, within the observational uncertainty, both the sun and Sagittarius A lie in the mean plane of the Galaxy as determined from the hydrogen observations. If the sun had not been so placed, points in the mean plane would not lie on the galactic equator.

[Blaauw et al. 1959]

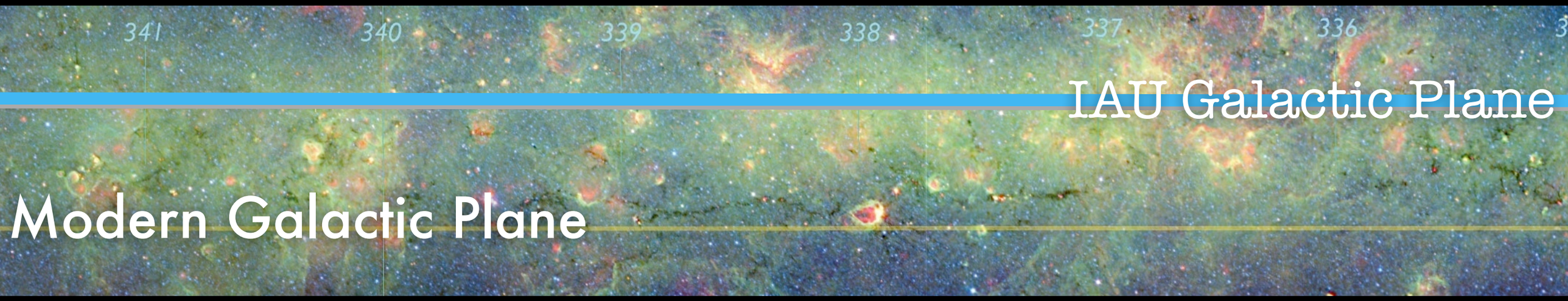
Sun is ~75 light years "above" the IAU Milky Way Plane

+

Galactic Center is ~20 light years offset from the IAU Milky Way Center

=

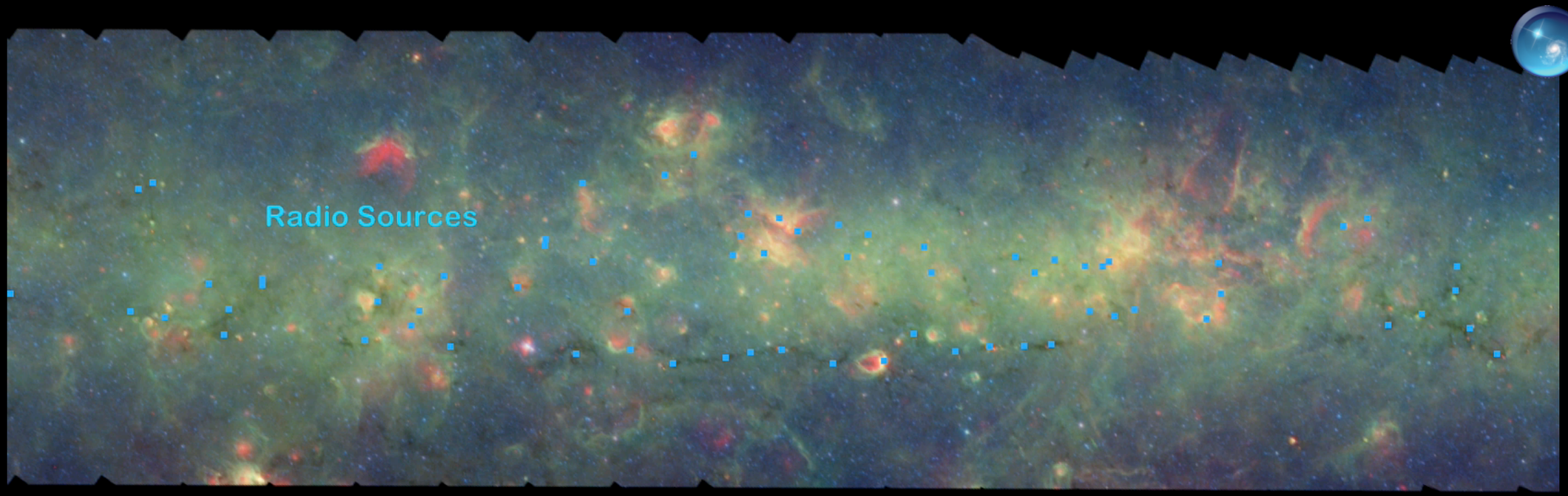
The Galactic Plane is not exactly where you'd think it is when you look at the sky, and...



Yes, Nessie is EXACTLY in the Galactic Plane!

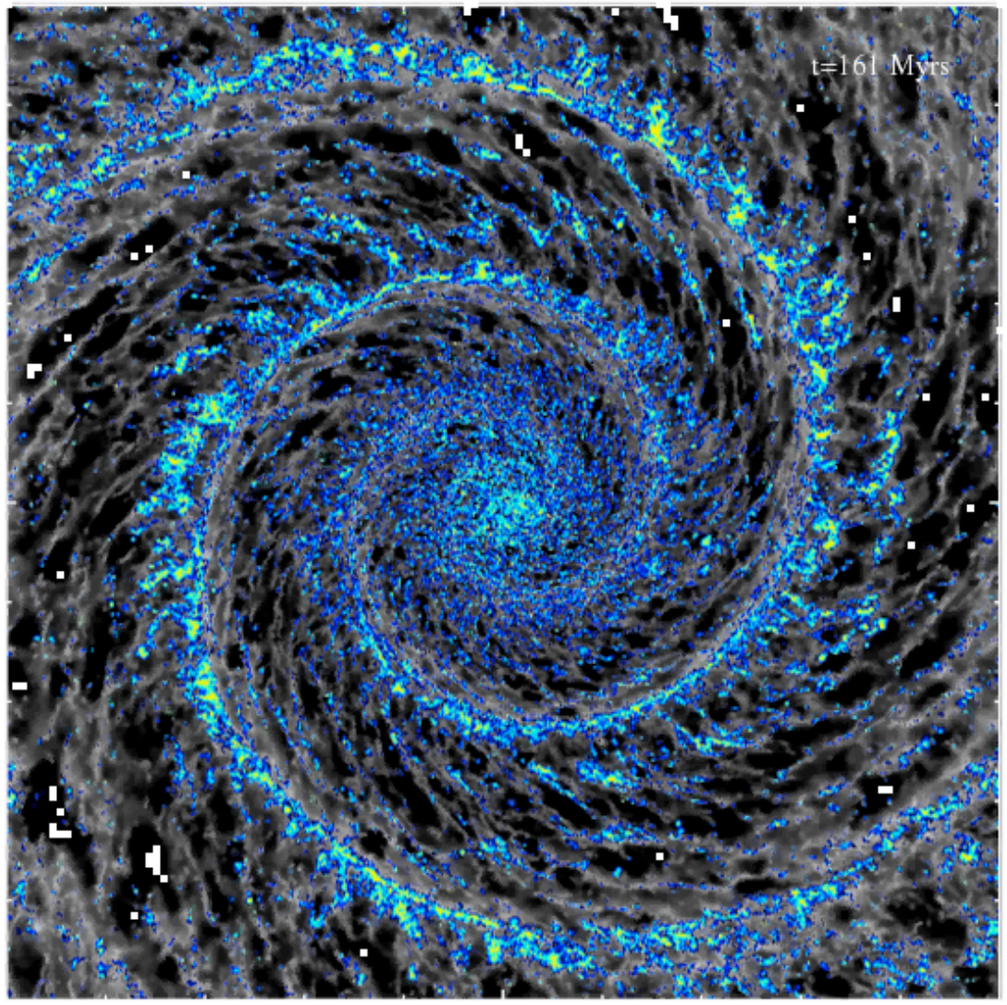
What about its distance?

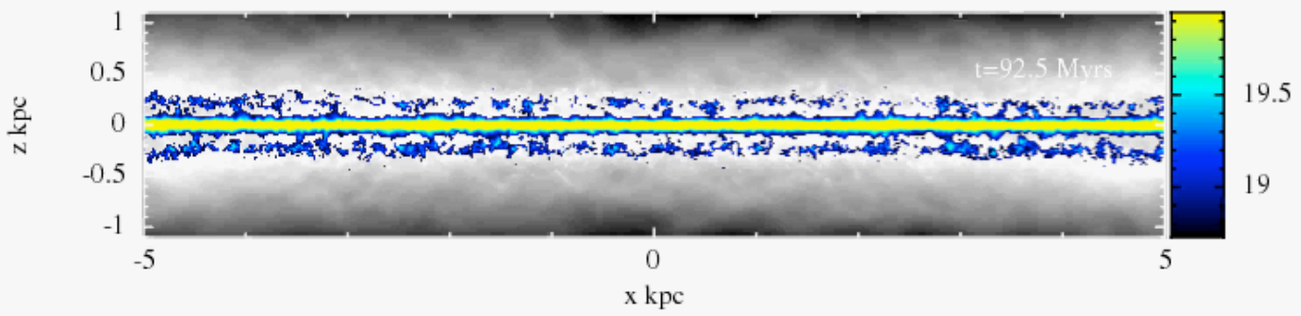
Velocity to Distance



A full 3D skeleton?

(flipped) image of IC342 from Jarrett et al. 2012; WISE Enhanced Resolution Galaxy Atlas



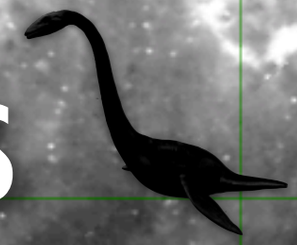


simulations courtesy Clare Dobbs

Monster to Bone

There could be ~1000 more of these to find...a full skeleton perhaps?

The Bones of the Milky Way: Credits



Seamless Astronomy-style tools used in this project

SEAMLESS ASTRONOMY
Linking scientific data, publications, and communities

authorea.com (open publishing)
theastrodata.org (open data)
glueviz.org (open source tools)
universe3d.org (collaborative data)
worldwidetelescope.org (universe information system)
virtual observatory standards (international online information-sharing systems)

Supported by

Microsoft Research
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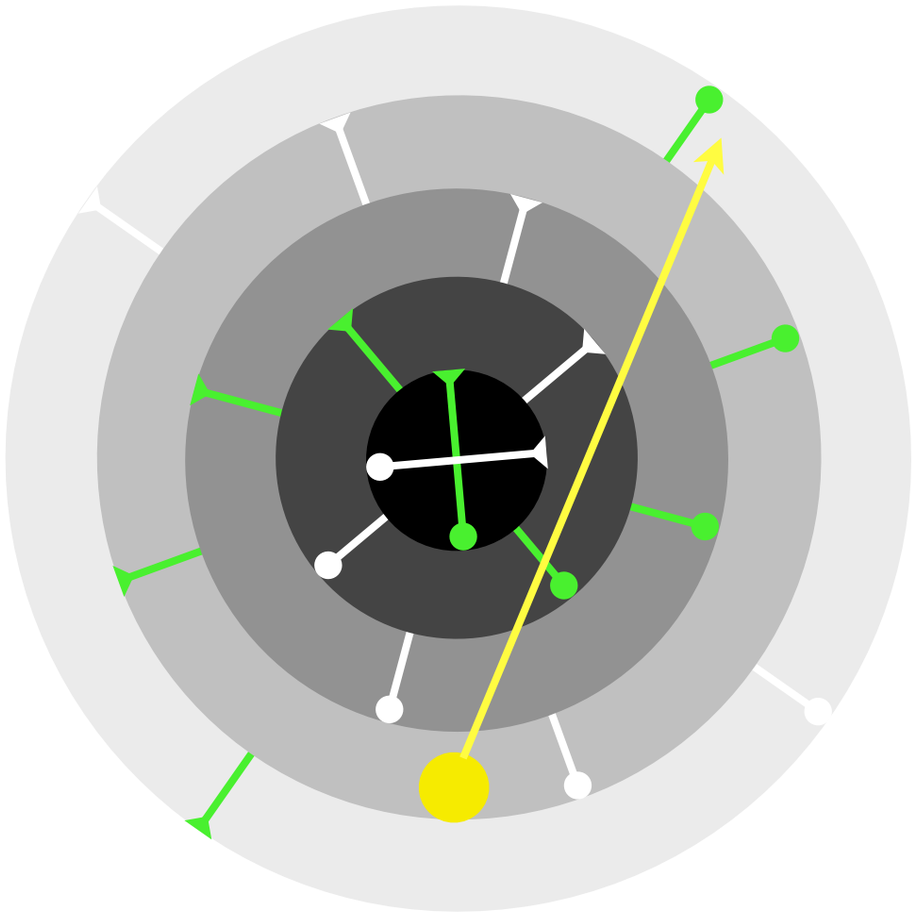
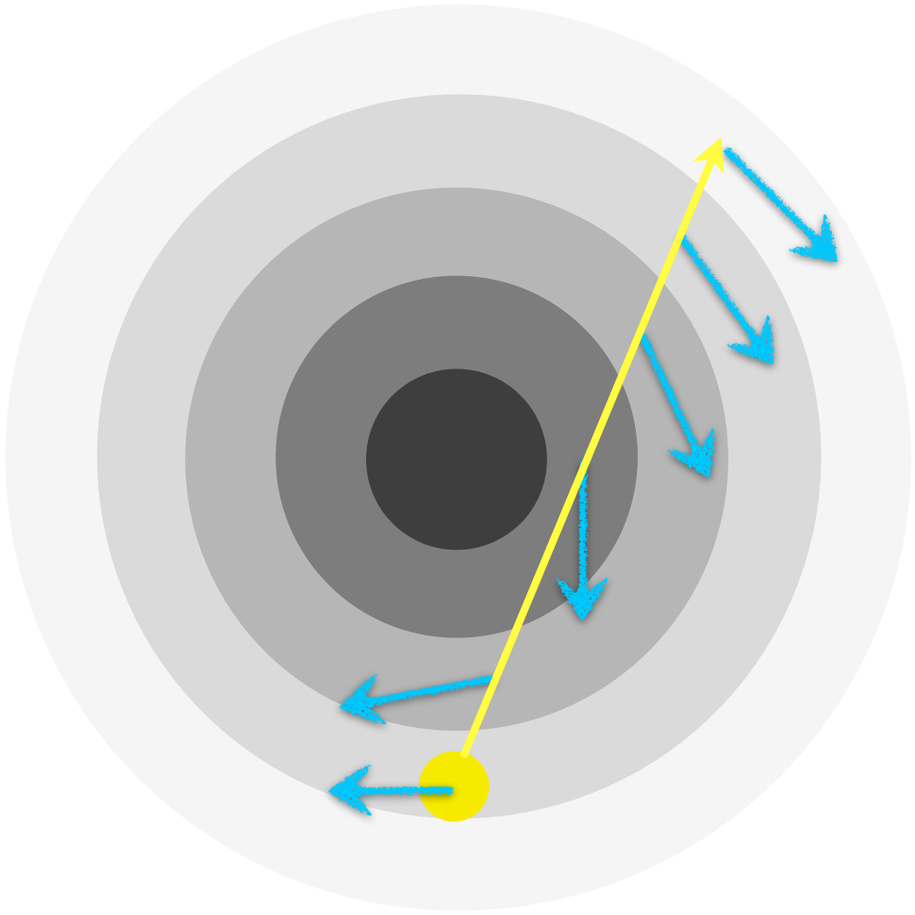
VERITAS
Smithsonian

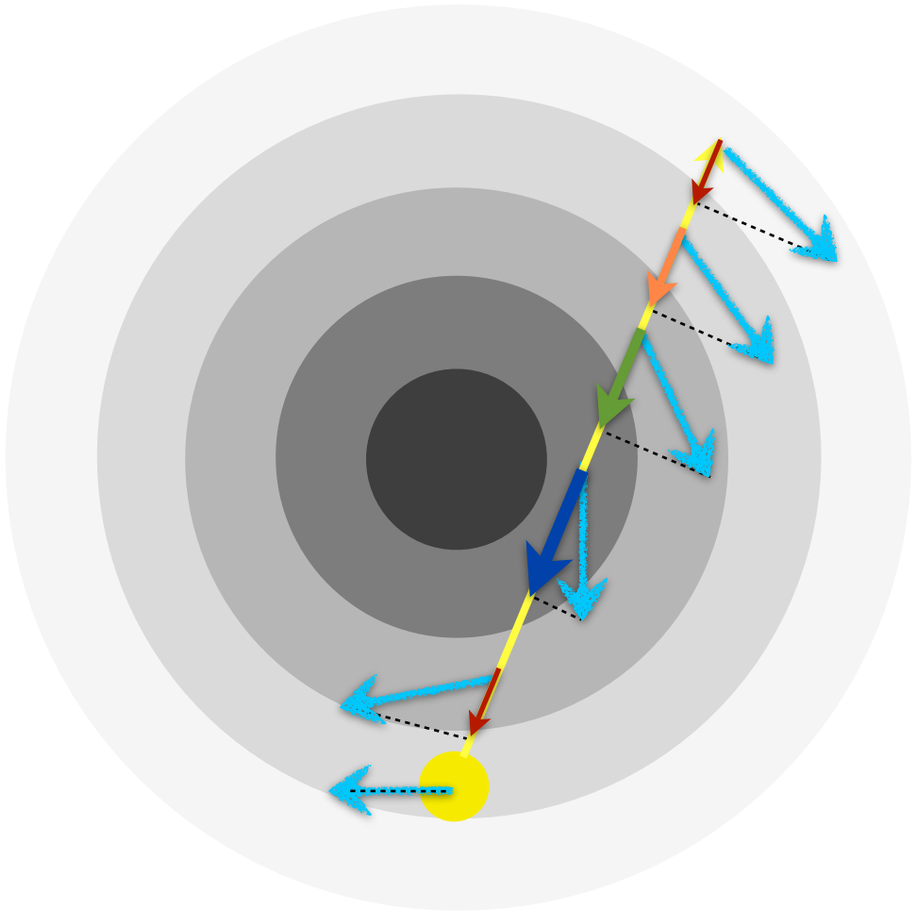
Alyssa Goodman, m:617-230-7080; url: milkywaybones.org

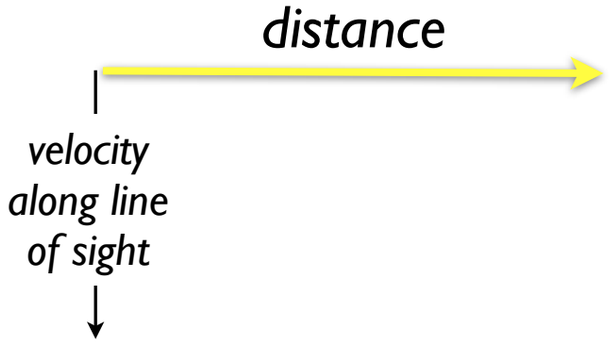
milkywaybones.org

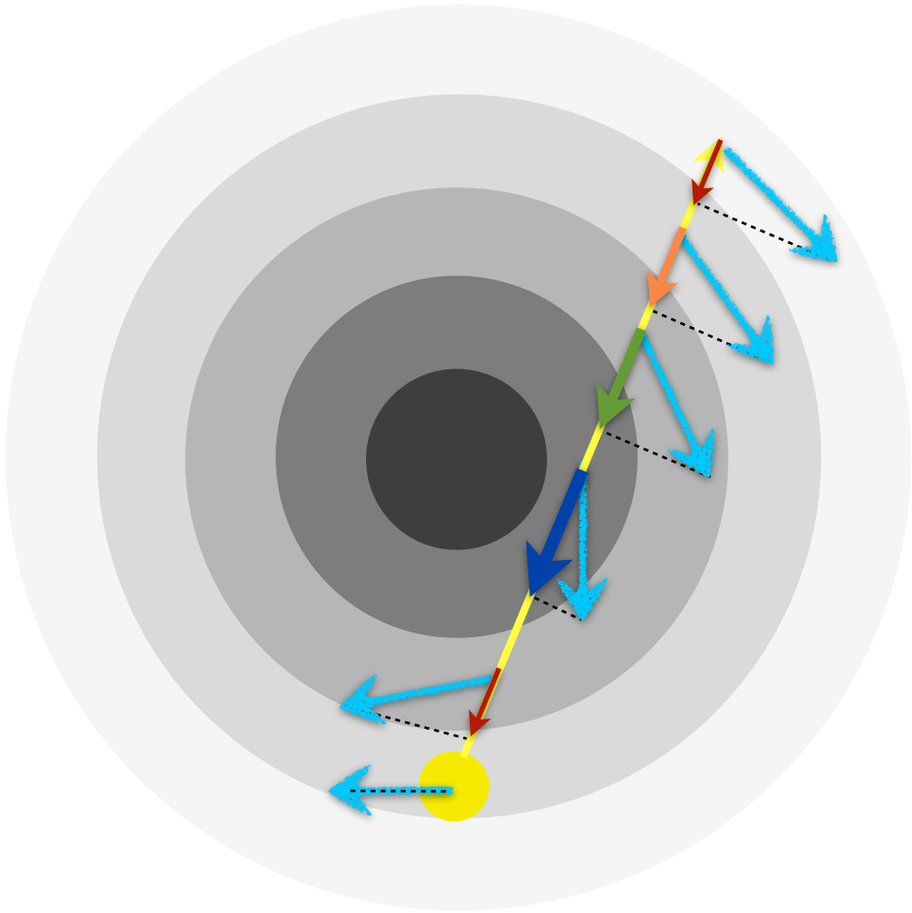
A Spiral Galaxy Observed from its Outskirts...

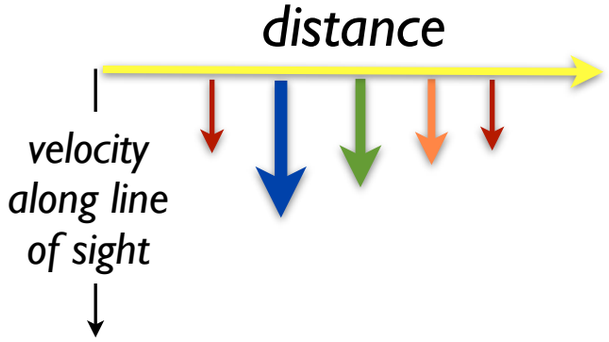




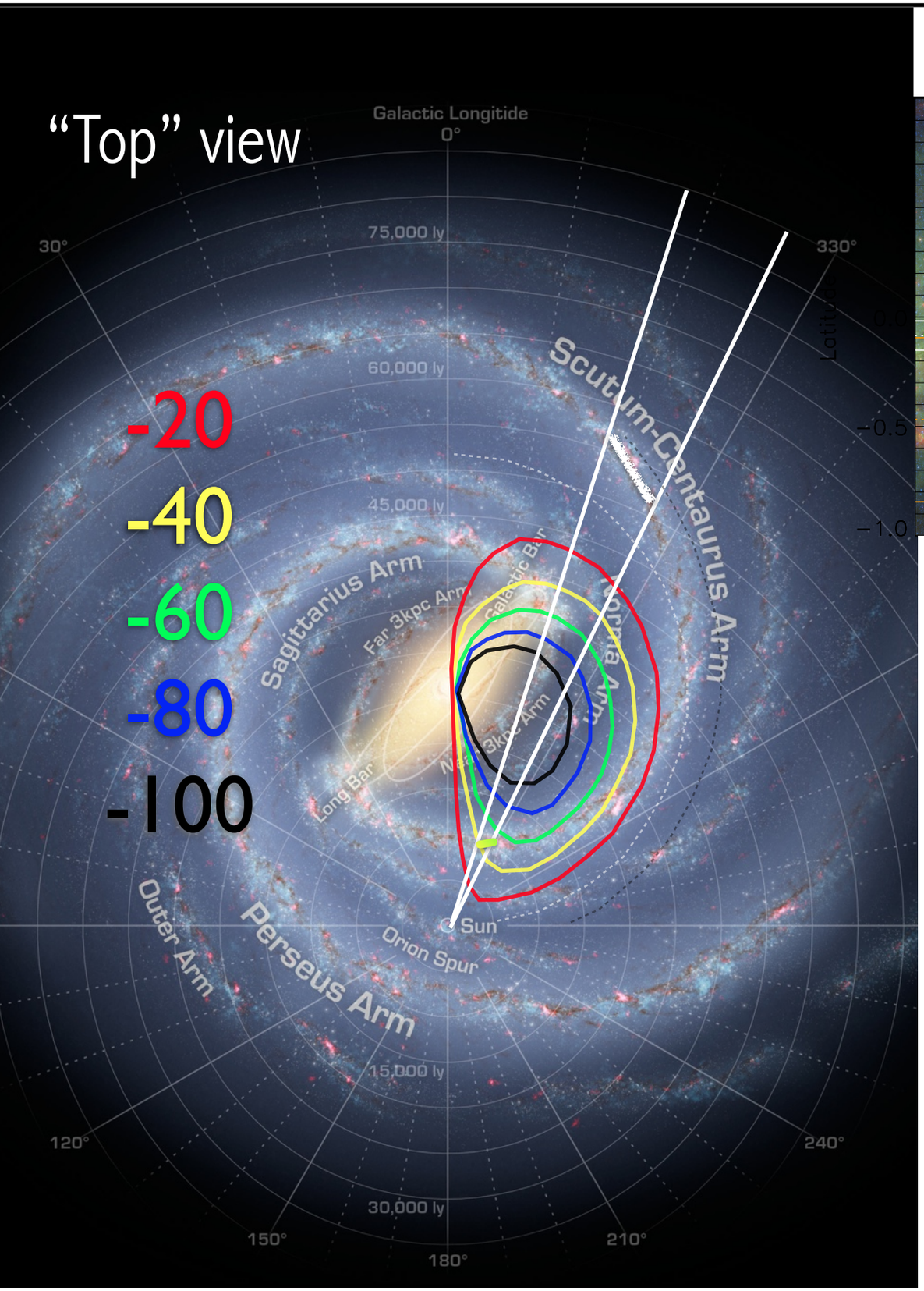


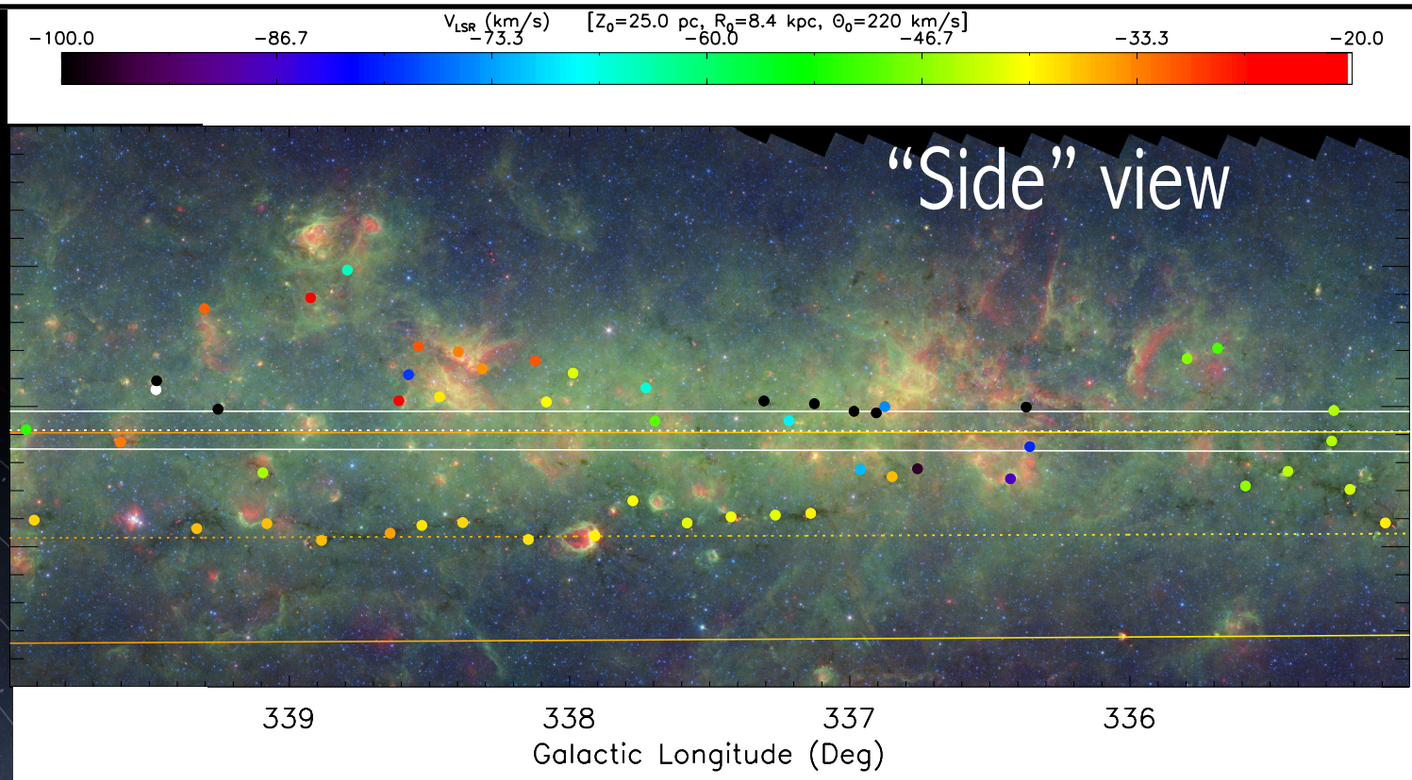

distance
velocity
along line
of sight




distance
velocity
along line
of sight

Using Velocity Constraints

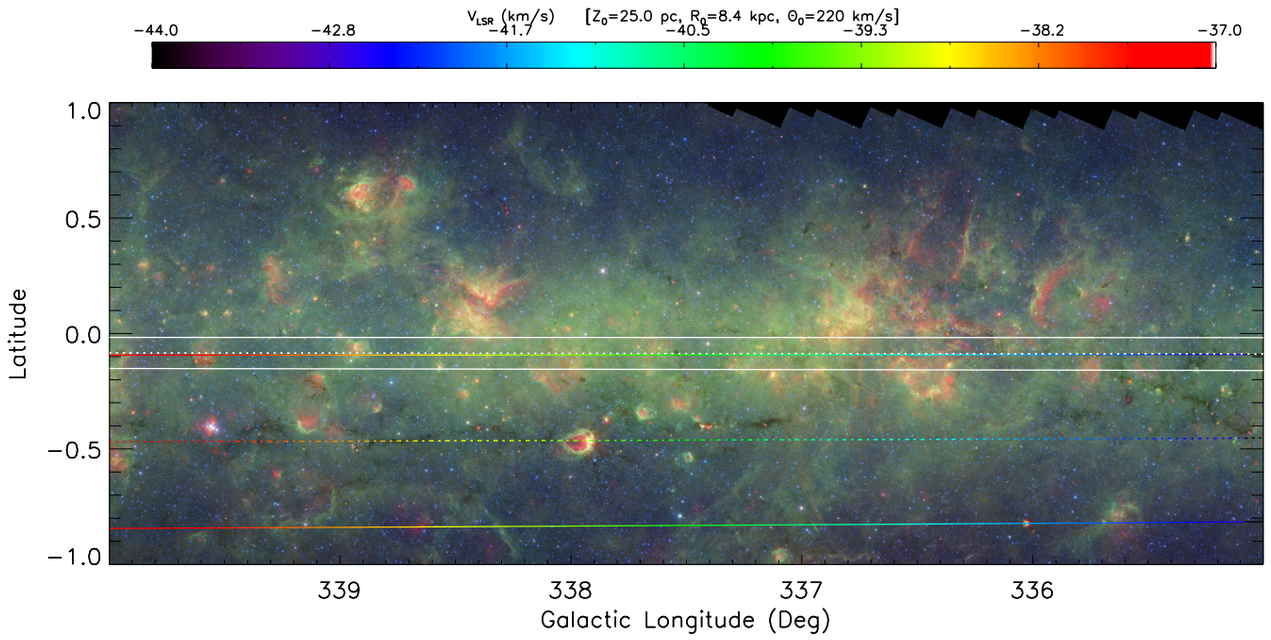




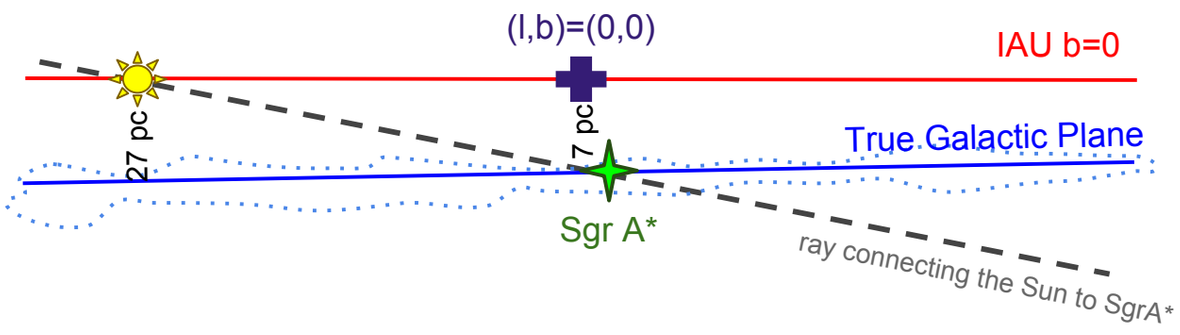
Left: Scientist-artist Robert Hurt's view of the Milky Way
(cartoon based on stars, CO, HI, masers & HII regions; Benjamin, Dame et al.)

Where is "Nessie," in 3D?

How close to "in" the plane?

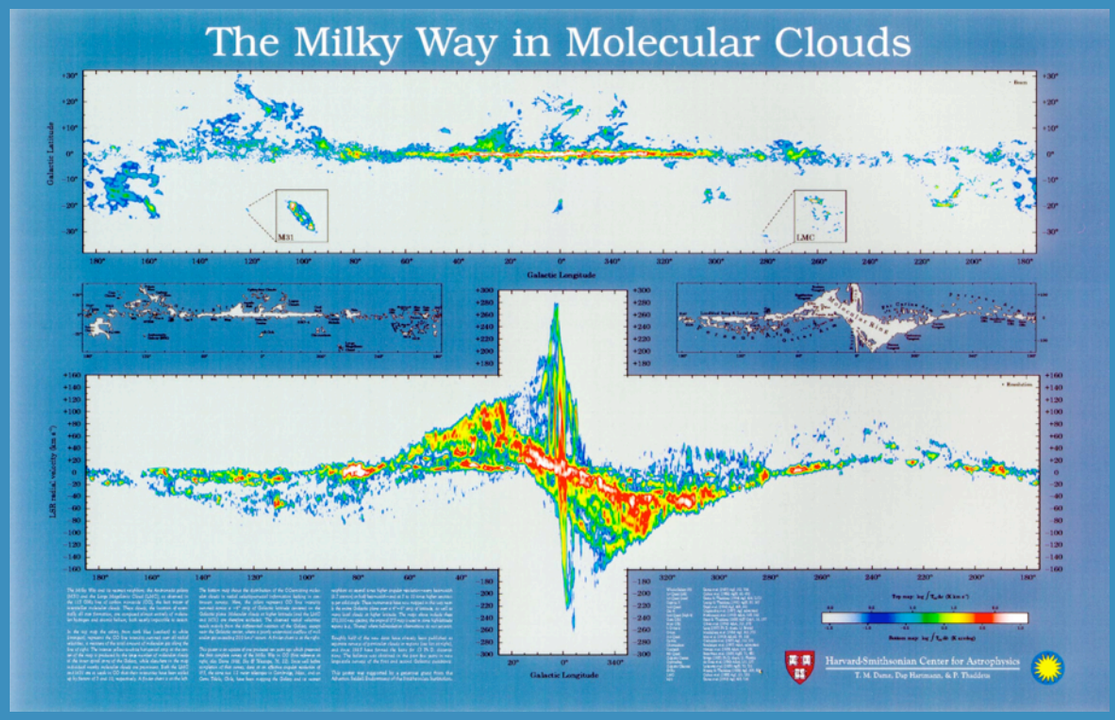


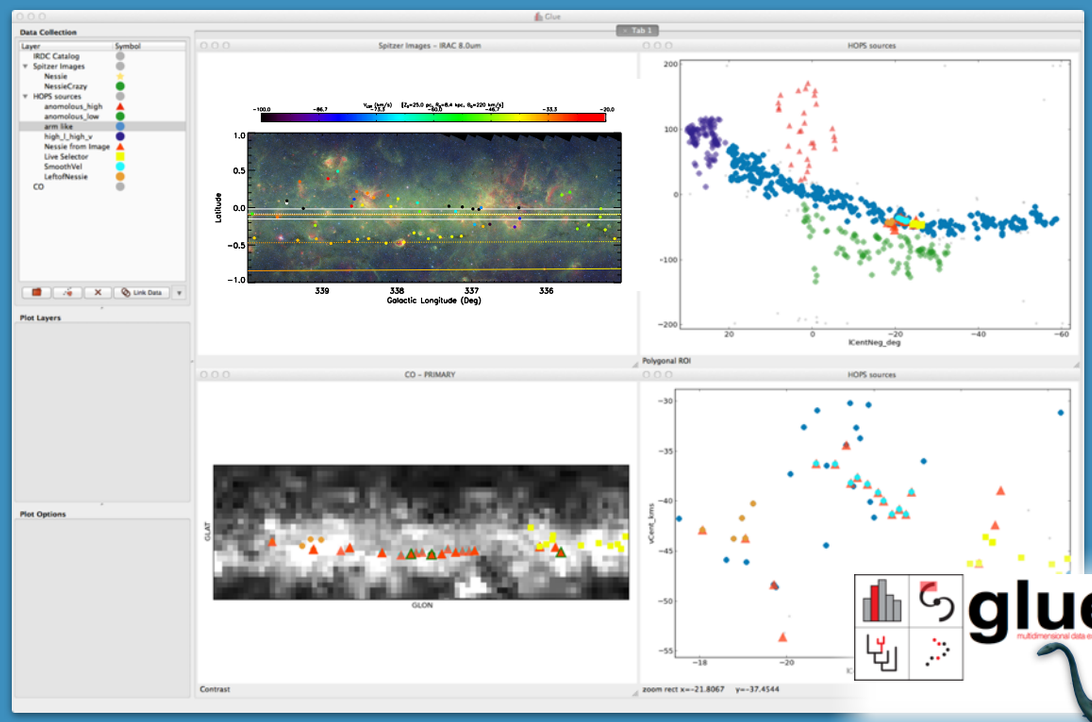
Drawing is schematic--NOT to scale



Notes:
IAU b=0 set from HI, which is uncertain by ~0.1 degrees
tilt of red w.r.t. blue would be (20/8400)*180/pi=0.13 degrees

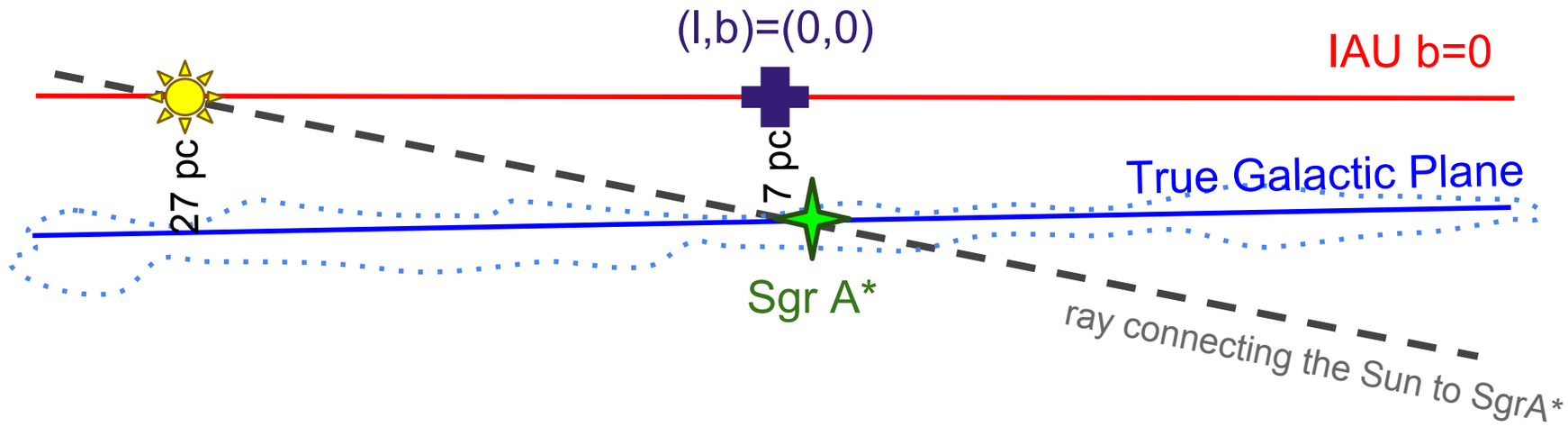
At what distance & inclination to l.o.s?





“Advanced” Galactic Geometry

Drawing is schematic--NOT to scale



Notes:
IAU b=0 set from HI, which is uncertain by ~0.1 degrees
tilt of red w.r.t. blue would be (20/8400)*180/pi=0.13 degrees