Globular Clusters

Our new SeeStar Users walk in Shapley's foot prints.

by

Lee Erickson

Globular Cluster Photos

Members Early SeeStar Photos

Peggy Brukman,

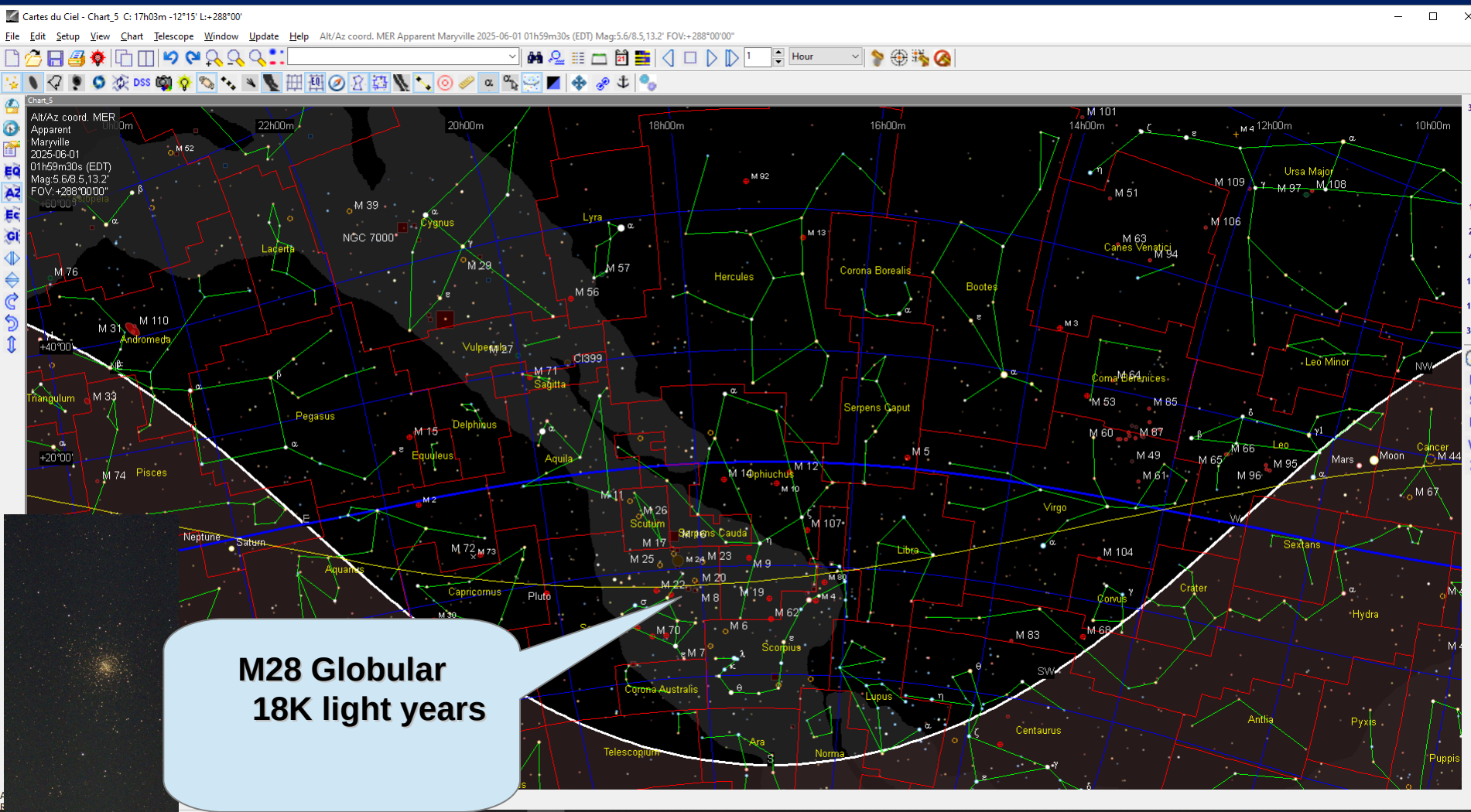
Tim Cox,

Gene Johnson,

and others

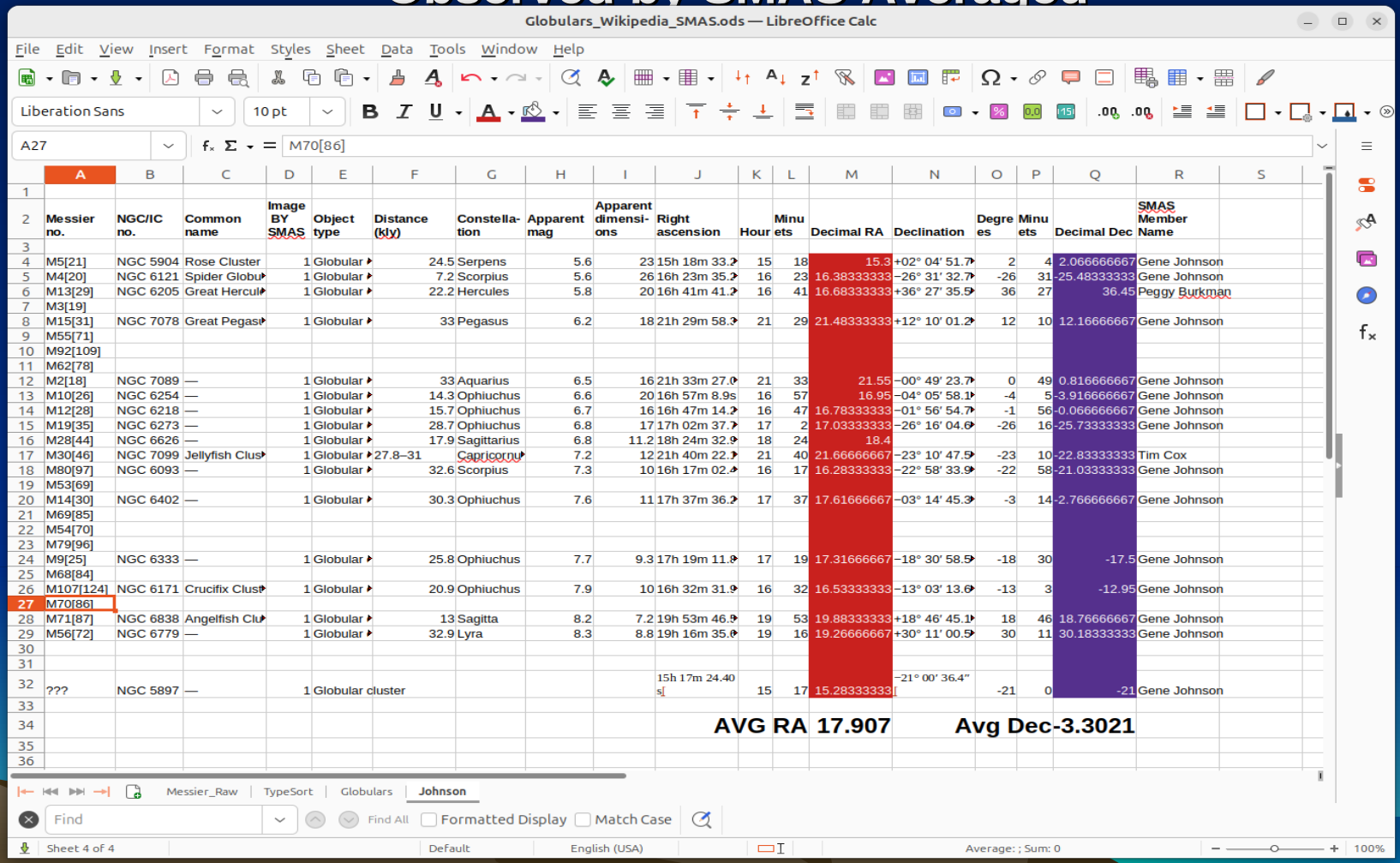
Spring Star Party

Same star party, April 1th Foothills Parkway.



Globular Clusters Across The Sky

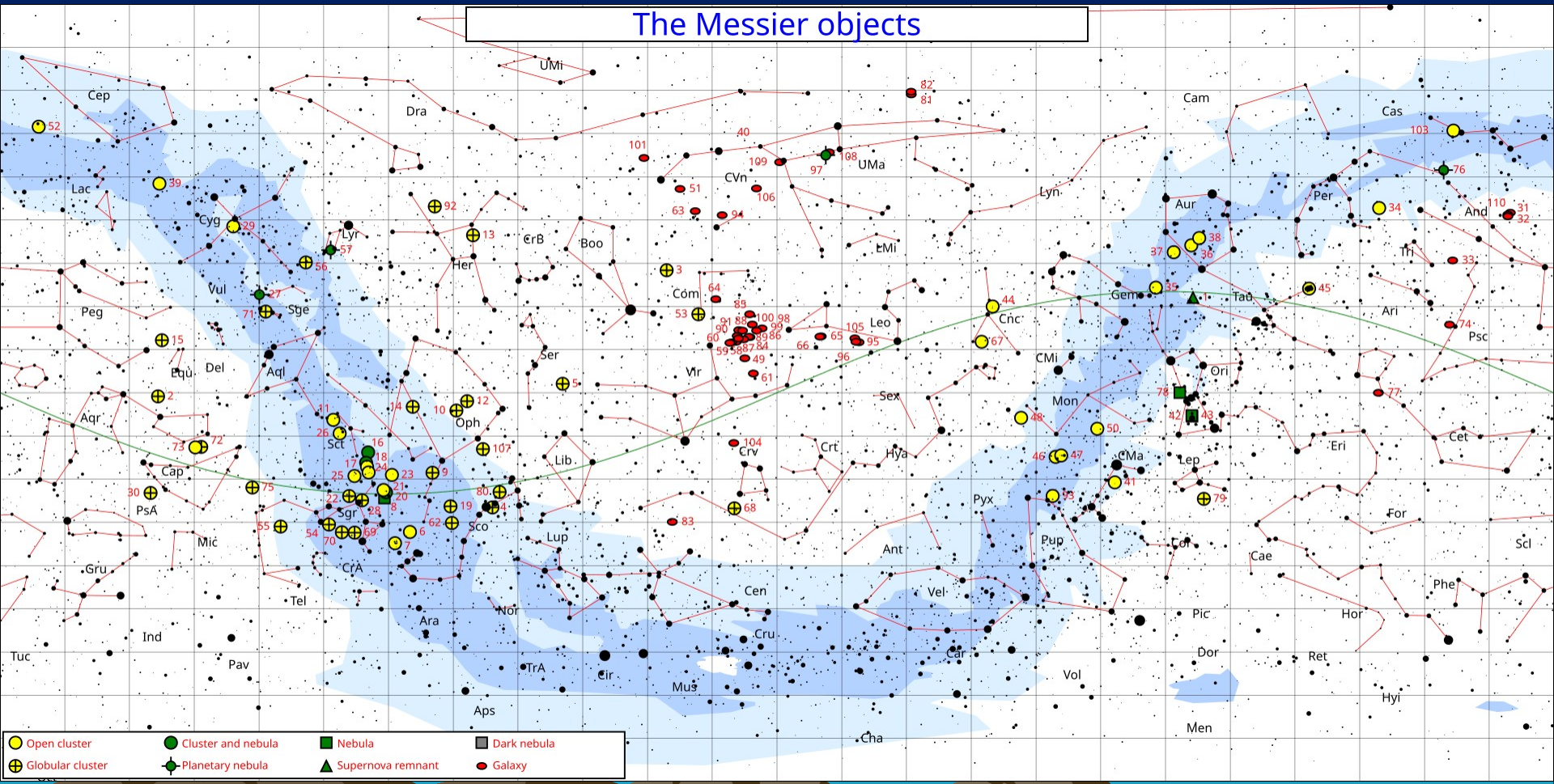
The Right Ascension, Declination
Observed by SMAS Averaged



Messier no.	NGC/IC no.	Common name	Image BY SMAS	Object type	Distance (kly)	Constellation	Apparent mag	Apparent dimensions	Right ascension	Hours	Minutes	Decimal RA	Declination	Degrees	Minutes	Decimal Dec	SMAS Member Name
M5[21]	NGC 5904	Rose Cluster	1	Globular	24.5	Serpens	5.6	23	15h 18m 33.2	15	18	15.3	+02° 04′ 51.7	2	4	2.066666667	Gene Johnson
M4[20]	NGC 6121	Spider Globu	1	Globular	7.2	Scorpius	5.6	26	16h 23m 35.2	16	23	16.38333333	−26° 31′ 32.7	-26	31	-25.48333333	Gene Johnson
M13[29]	NGC 6205	Great Hercul	1	Globular	22.2	Hercules	5.8	20	16h 41m 41.2	16	41	16.68333333	+36° 27′ 35.5	36	27	36.45	Peggy Burkman
M3[19]																	
M15[31]	NGC 7078	Great Pegasi	1	Globular	33	Pegasus	6.2	18	21h 29m 58.2	21	29	21.48333333	+12° 10′ 01.2	12	10	12.16666667	Gene Johnson
M55[71]																	
M92[109]																	
M62[78]																	
M2[18]	NGC 7089	—	1	Globular	33	Aquarius	6.5	16	21h 33m 27.0	21	33	21.55	−00° 49′ 23.7	0	49	0.816666667	Gene Johnson
M10[26]	NGC 6254	—	1	Globular	14.3	Ophiuchus	6.6	20	16h 57m 8.9s	16	57	16.95	−04° 05′ 58.1	-4	5	-3.916666667	Gene Johnson
M12[28]	NGC 6218	—	1	Globular	15.7	Ophiuchus	6.7	16	16h 47m 14.2	16	47	16.78333333	−01° 56′ 54.7	-1	56	-0.066666667	Gene Johnson
M19[35]	NGC 6273	—	1	Globular	28.7	Ophiuchus	6.8	17	17h 02m 37.7	17	2	17.03333333	−26° 16′ 04.6	-26	16	-25.73333333	Gene Johnson
M28[44]	NGC 6626	—	1	Globular	17.9	Sagittarius	6.8	11.2	18h 24m 32.9	18	24	18.4					
M30[46]	NGC 7099	Jellyfish Clus	1	Globular	27.8–31	Capricornu	7.2	12	21h 40m 22.1	21	40	21.66666667	−23° 10′ 47.5	-23	10	-22.83333333	Tim Cox
M80[97]	NGC 6093	—	1	Globular	32.6	Scorpius	7.3	10	16h 17m 02.4	16	17	16.28333333	−22° 58′ 33.9	-22	58	-21.03333333	Gene Johnson
M53[69]																	
M14[30]	NGC 6402	—	1	Globular	30.3	Ophiuchus	7.6	11	17h 37m 36.2	17	37	17.61666667	−03° 14′ 45.3	-3	14	-2.766666667	Gene Johnson
M69[85]																	
M54[70]																	
M79[96]																	
M9[25]	NGC 6333	—	1	Globular	25.8	Ophiuchus	7.7	9.3	17h 19m 11.8	17	19	17.31666667	−18° 30′ 58.5	-18	30	-17.5	Gene Johnson
M68[84]																	
M107[124]	NGC 6171	Crucifix Clust	1	Globular	20.9	Ophiuchus	7.9	10	16h 32m 31.9	16	32	16.53333333	−13° 03′ 13.6	-13	3	-12.95	Gene Johnson
M70[86]																	
M71[87]	NGC 6838	Angelfish Clu	1	Globular	13	Sagitta	8.2	7.2	19h 53m 46.5	19	53	19.88333333	+18° 46′ 45.1	18	46	18.76666667	Gene Johnson
M56[72]	NGC 6779	—	1	Globular	32.9	Lyra	8.3	8.8	19h 16m 35.0	19	16	19.26666667	+30° 11′ 00.5	30	11	30.18333333	Gene Johnson
???	NGC 5897	—	1	Globular cluster					15h 17m 24.40s	15	17	15.28333333	−21° 00′ 36.4″	-21	0	-21	Gene Johnson
												AVG RA 17.907				Avg Dec-3.3021	

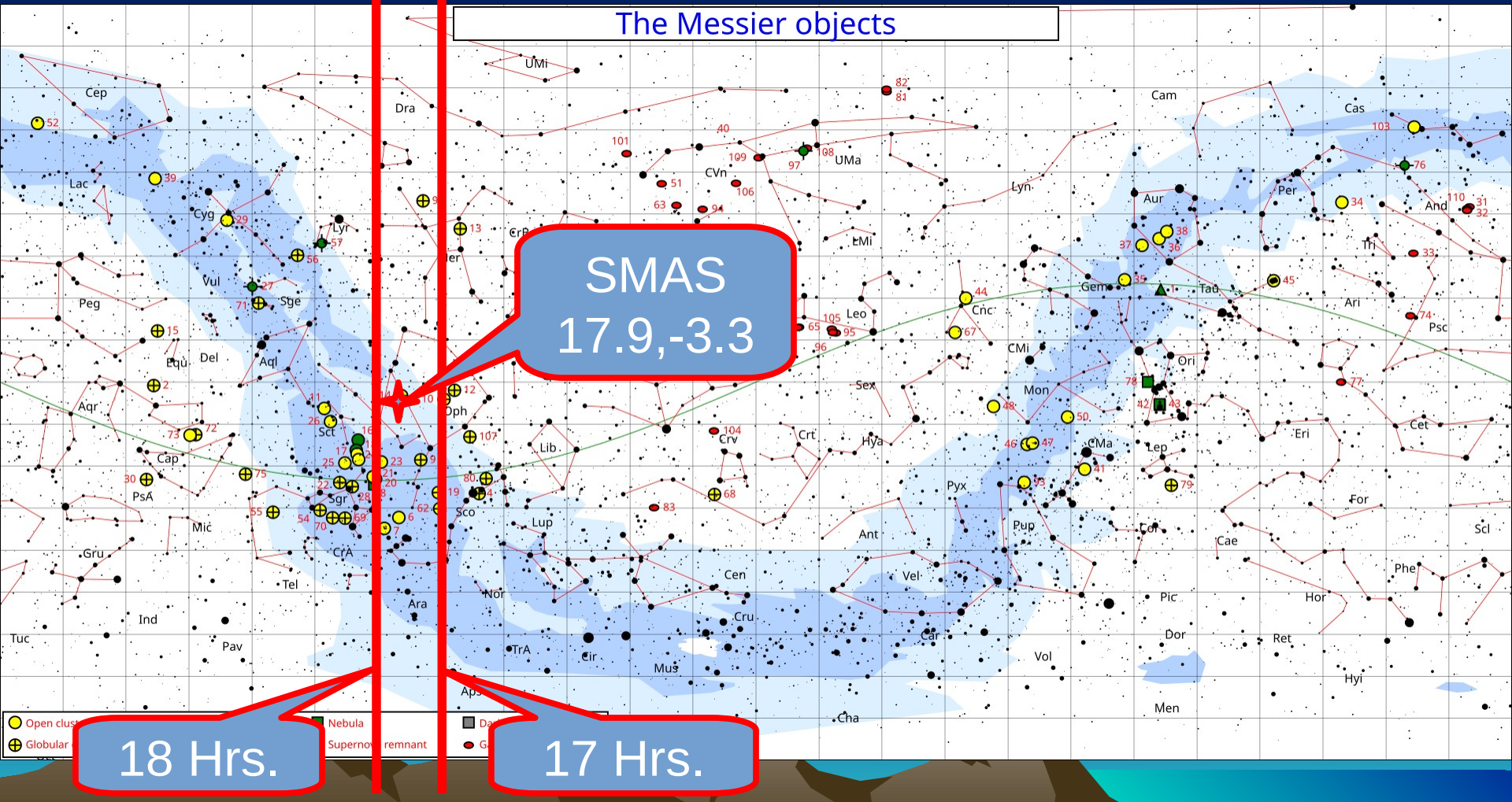
Messier's Across The Sky

Globulars and More



Globular Clusters Across The Sky

Center of Globulars



Globular Clusters Across The Sky

Center of Globulars

AI Overview

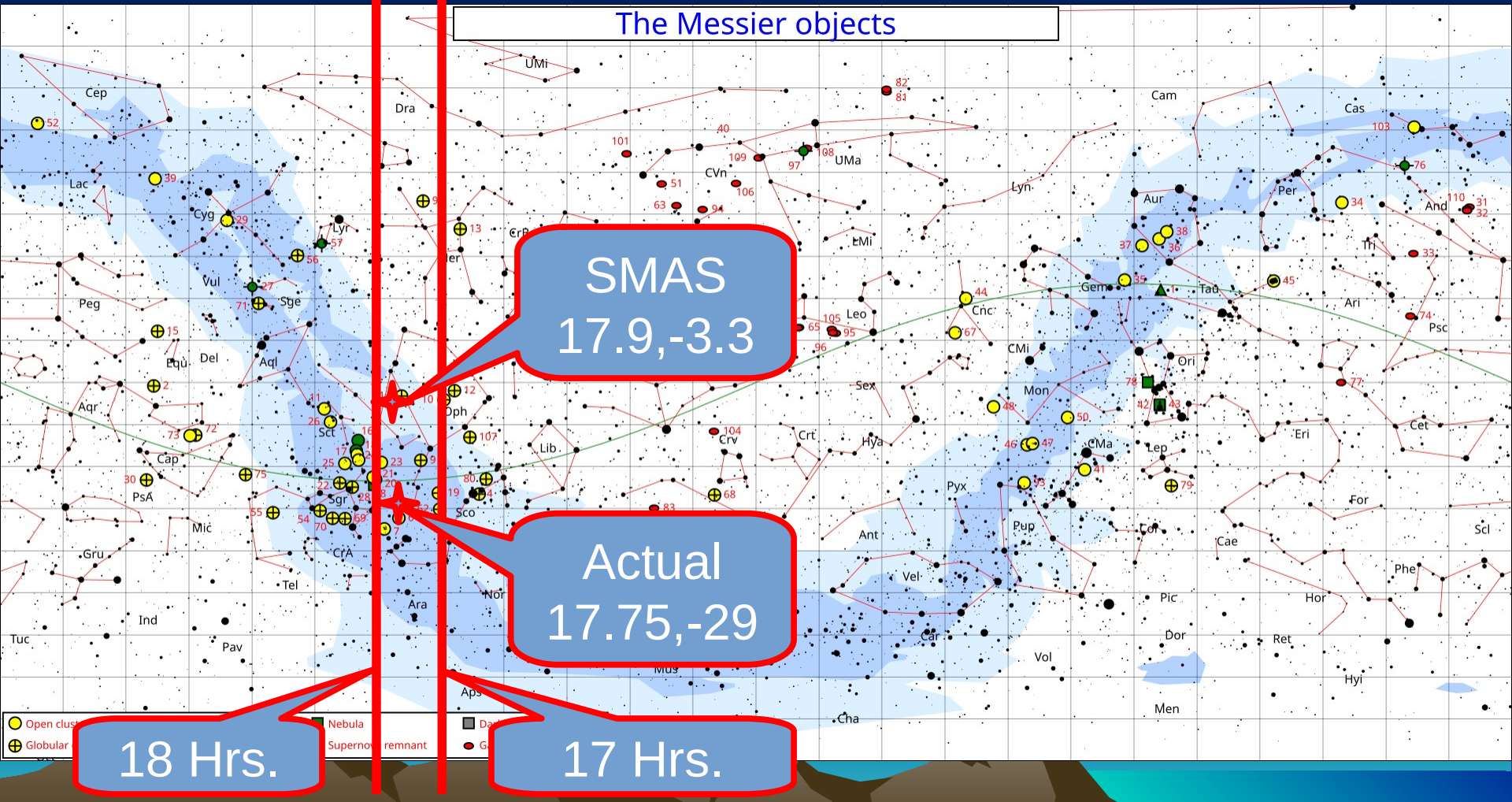
The center of the Milky Way galaxy is located at an approximate Right Ascension (RA) of $17^h45^m40.04^s$ and a Declination (Dec) of $-29^\circ00'28.1''$ (J2000 epoch). This position corresponds to the location of Sagittarius A* and is centered in the constellation Sagittarius.

- **Right Ascension (RA):** $17^h45^m40.04^s$
- **Declination (Dec):** $-29^\circ00'28.1''$
- **Epoch:** J2000
- **Constellation:** Sagittarius
- **Best Marker:** The supermassive black hole and radio source Sagittarius A* marks the precise center.

Hrs. Hrs.

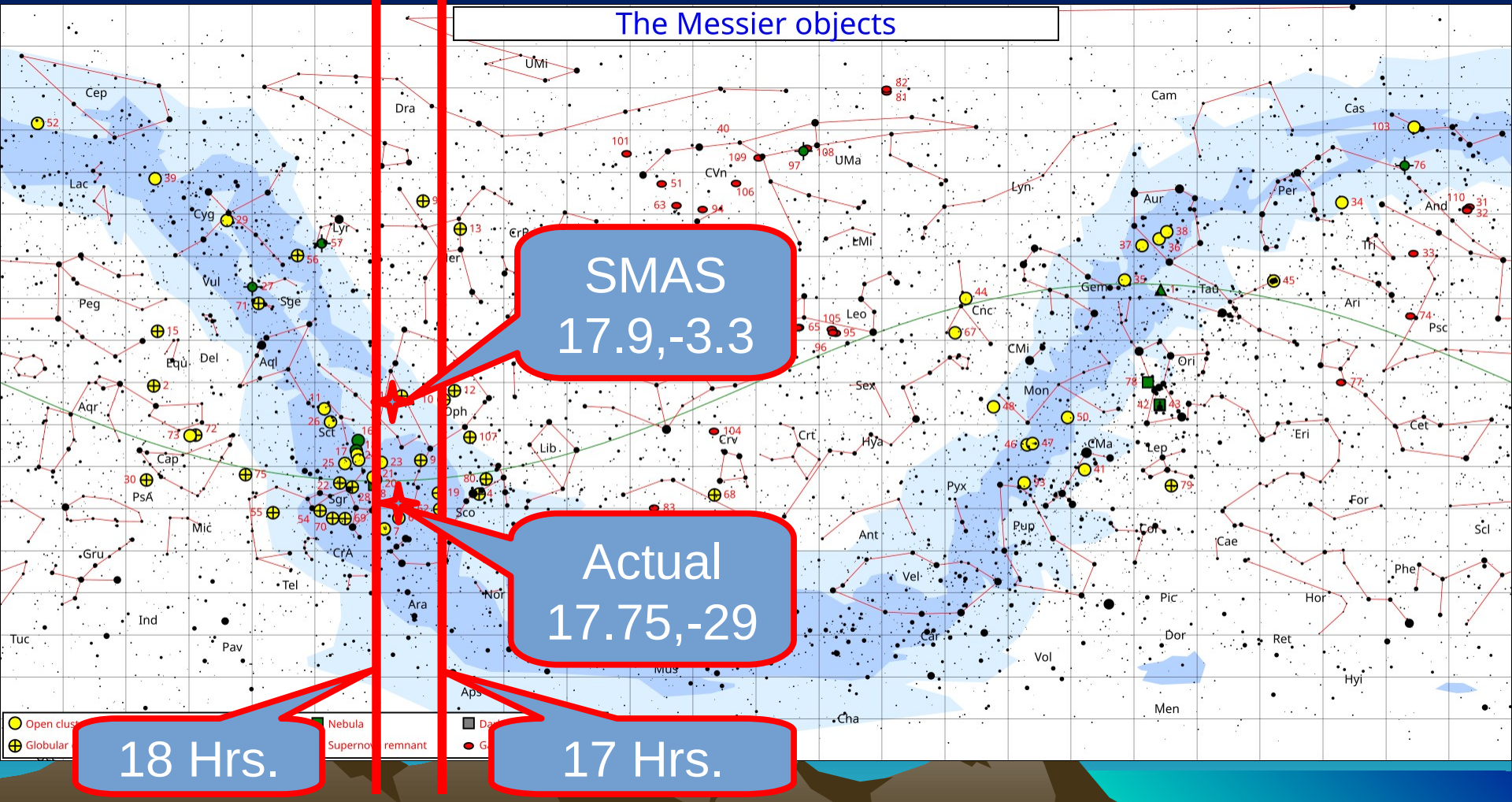
Globular Clusters Across The Sky

Center of Globulars



Not Bad, Not Even Trying.

How is this? Probably some luck.



Following Shapley

1918 Analysis






STUDIES BASED ON THE COLORS AND MAGNITUDES IN STELLAR CLUSTERS[1]

SEVENTH PAPER: THE DISTANCES, DISTRIBUTION IN SPACE, AND DIMENSIONS OF 69 GLOBULAR CLUSTERS

By HARLOW SHAPLEY

I. PARALLAXES FROM VARIABLE STARS, APPARENT MAGNITUDES, AND ANGULAR DIAMETERS

Applying the methods discussed in the preceding *Contribution*,[2] the parallaxes of a few clusters are obtained directly from the periods and magnitudes of Cepheid variables; the parallaxes of a considerably larger number are derived from the mean magnitudes of the brightest cluster stars, and the survey is then made complete through measures of diameters of the photographic images of all globular systems. In Table I are listed the clusters for which the variable stars have received a sufficiently detailed discussion to permit a determination of the parallax directly from the luminosity-period curve of Cepheid variation. The apparent diameters and the adopted parallaxes are taken from tables appearing on following pages; the method of weighting the results is also subsequently described.

The parallaxes for Messier 3, 5, 15, and 22, depending almost entirely on the median magnitudes of numerous variable stars, are the most accurate. The computed probable error of the absolute magnitude is ±0.2; that of the apparent magnitude is estimated to vary from ±0.05 for Messier 3 to possibly ±0.2 for Messier 22. The corresponding limits of the probable error of the parallaxes are ±0″.000007 and ±0″.000015, that is, 10 and 13 per cent, respectively.

For most other clusters, of course, the errors are somewhat greater, particularly for those where the parallax depends solely upon either the magnitudes of the brightest stars or the measured

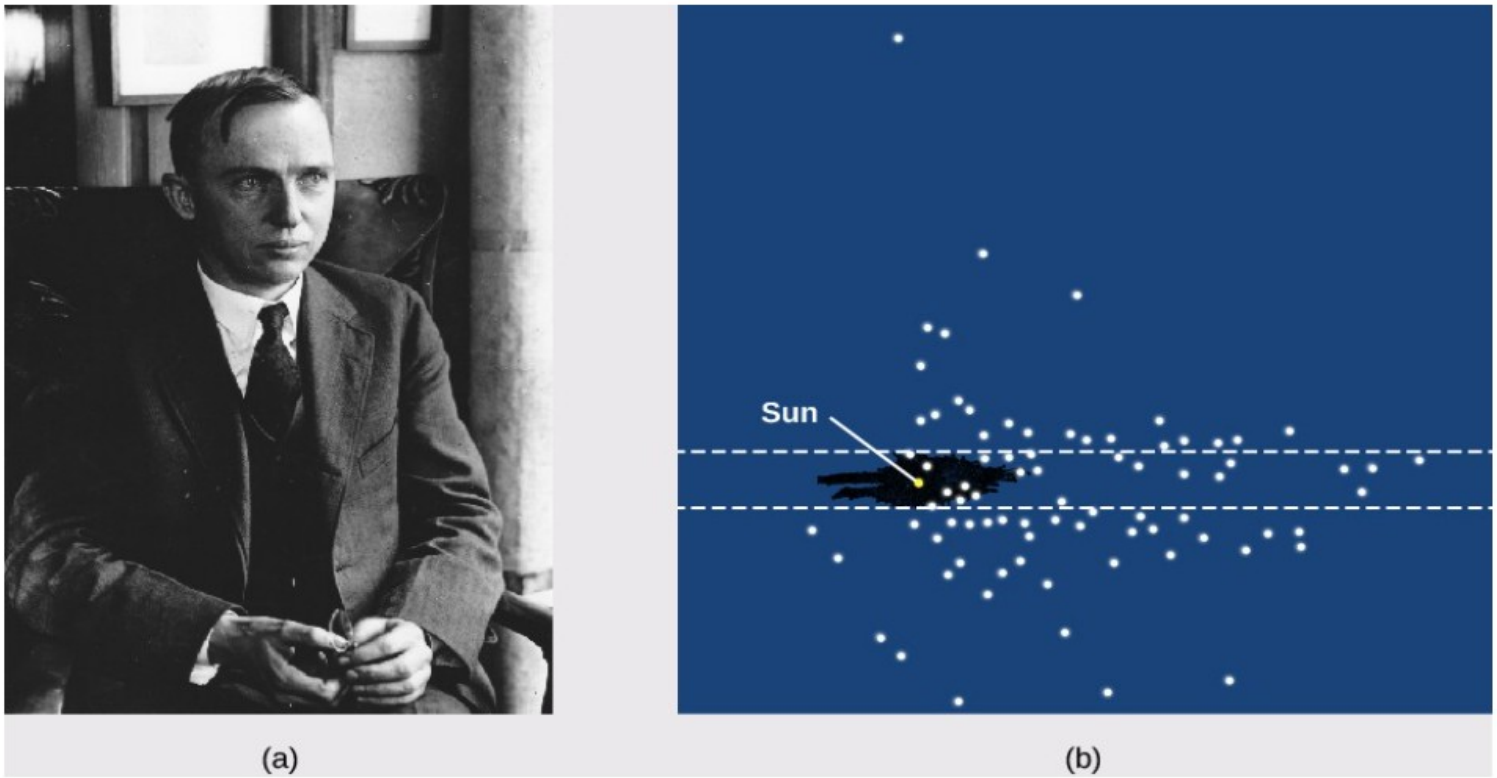
[1] *Contributions from the Mount Wilson Solar Observatory*, No. 152.

[2] *Mt. Wilson Contr.*, No. 151.

Shapley Puts Us In Our Place

Gloublar Distribution in Space

Harlow Shapley and His Diagram of the Milky Way.
(a) Shapley poses for a formal portrait. (b) His diagram shows the location of globular clusters, with the position of the Sun also marked. The black area shows Herschel's old diagram, centered on the Sun, approximately to scale.

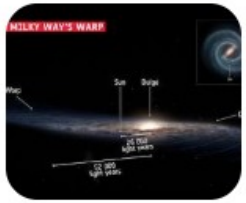


Shapley's work showed once and for all that our star has no special place in the Galaxy. We are in a nondescript region of the Milky Way, only one of 200 to 400 billion stars that circle the distant center of our Galaxy.

Shapley Estimates Size

IIRC, Asimov says first OVER estimate of size of “Universe”

AI Overview



Harlow Shapley's estimate of the Milky Way's center was inaccurate because he underestimated the effect of interstellar dust, which made him overestimate the distance to the galactic center. He calculated the center to be about 50,000 light-years away, but modern estimates place it at approximately 27,000 light-years. Despite this overestimation, his work was groundbreaking in proving the Sun was not at the galaxy's center, a significant correction from previous beliefs.

- **The overestimation:** Shapley concluded the galactic center was roughly 50,000 light-years from the Sun.
- **The reason:** He did not fully account for dust within the galaxy, which blocks starlight and makes objects appear fainter and farther away than they are.
- **The modern understanding:** Current estimates are closer to 27,000 light-years, thanks to a better understanding of dust extinction and other factors, notes Brian Koberlein.
- **The historical significance:** Regardless of the incorrect distance, Shapley's analysis of globular clusters was revolutionary because it proved the Sun was not the center of the Milky Way, a fact first demonstrated by the uneven distribution of these clusters.

Review

SeeStar Gets You Images Fast.

SMAS members have sampled
the late winter, spring and summer sky.

In the Spring we had some galaxies.
In the summer we got nebula, both open and globular clusters.

Have found direction to our Galaxy Center!