

# CYGNUS X-1 AND HIGH MASS-X-RAY BINARIES

## The Black Hole

- Mass - 21 solar mass
- Diameter - 126 km
- Distance - 7600 light years
- First observed in 1964

## The Blue SuperGiant

- Mass - 40 solar mass
- Radius- 20 solar radii
- Temperature-30,000 K

0.24 AU

1 AU SCALE

## WHERE ARE THEY?

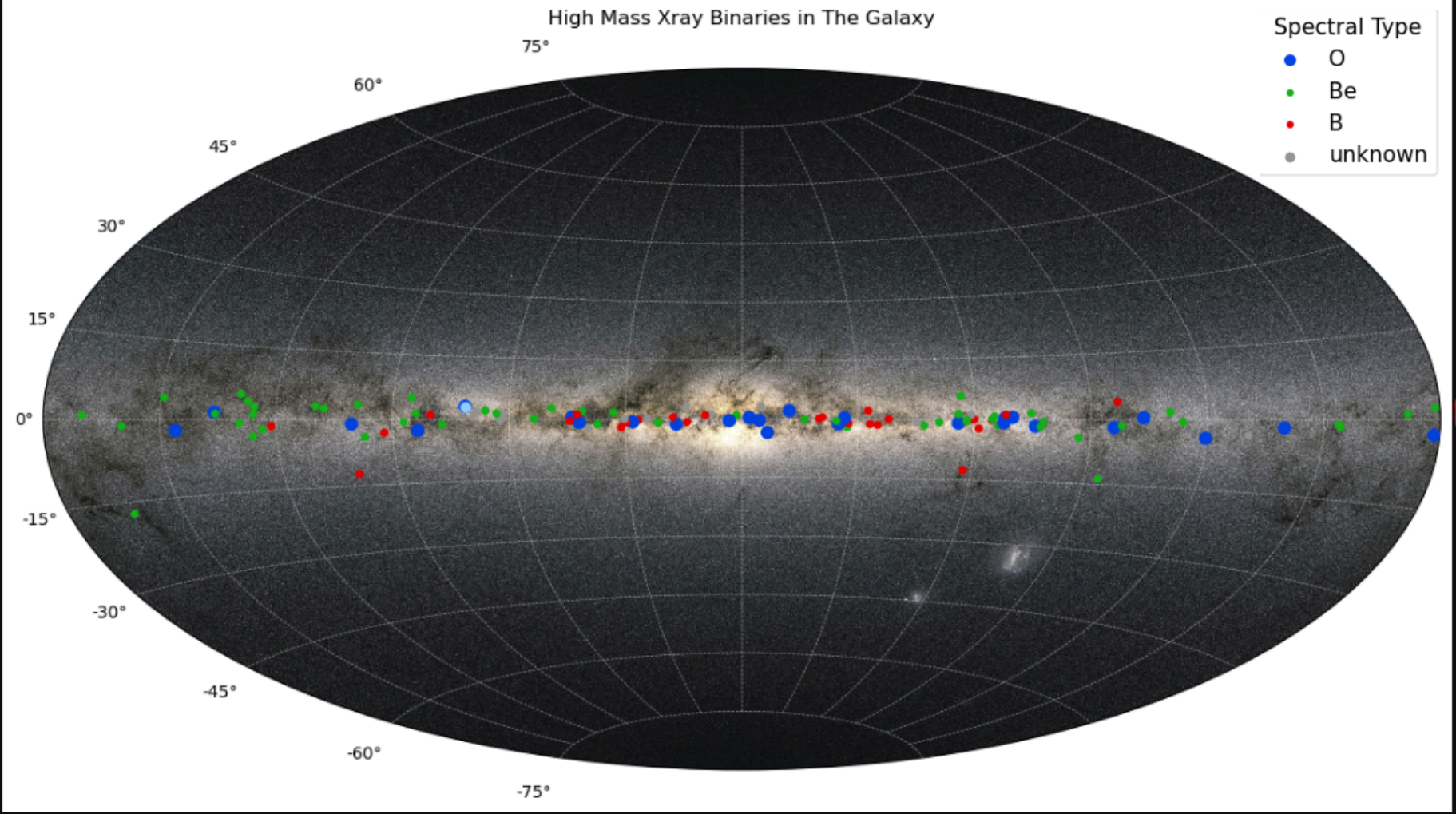


Fig 1. Galactic map of High mass X-ray binares in the Galaxy (background courtesy of ESA)

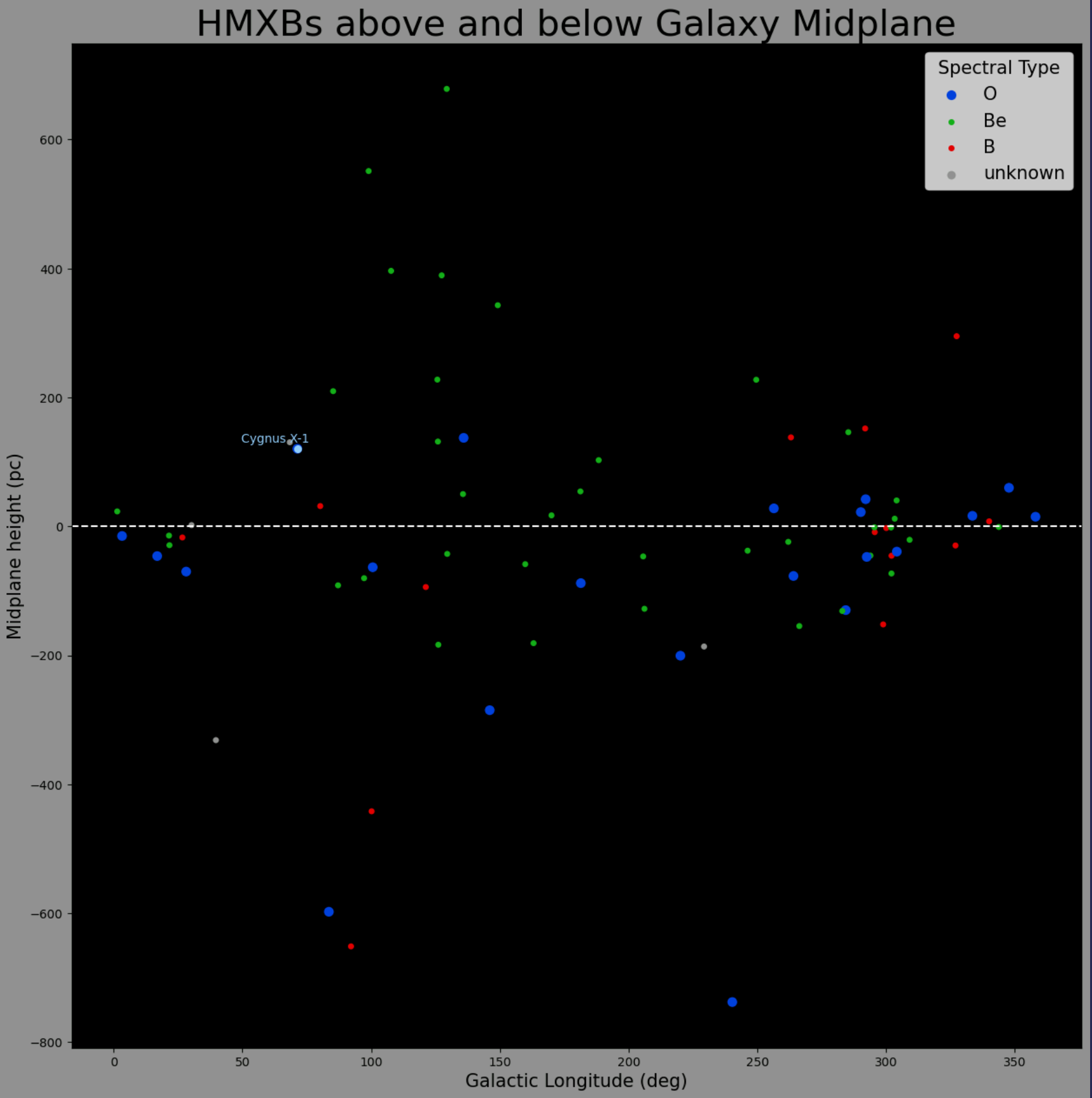
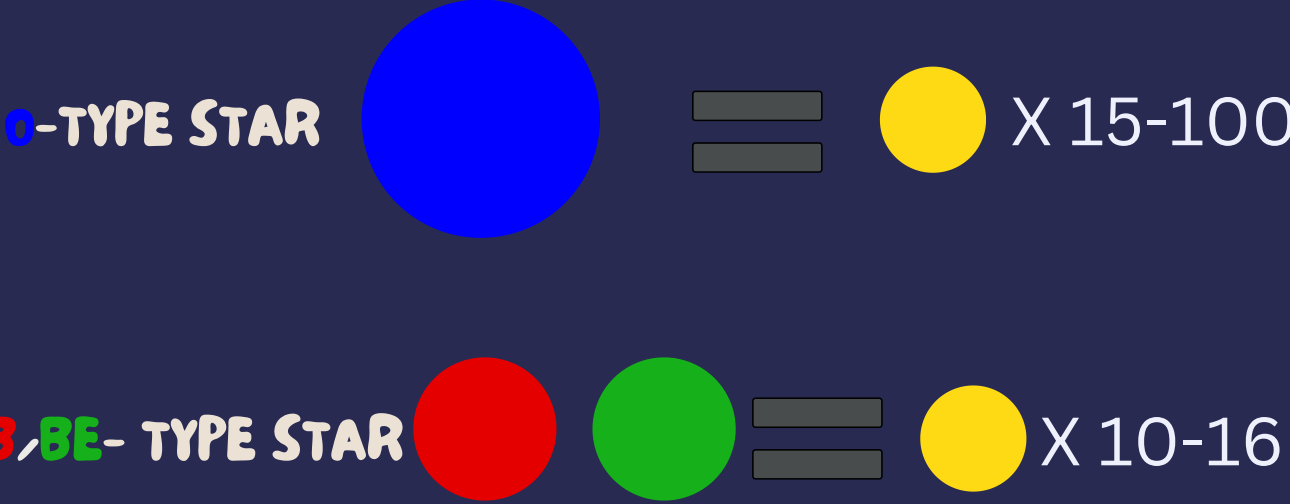


Fig 2. Galactic height map of HMXBs, height is represented as a star's distance above or below the galactic midplane in unit parsec.

## STELLAR MASS COMPARED TO SUN



## WHAT ARE THEY?

- High Mass X-Ray Binaries (HMXBs) consist of a massive OB star ( $\geq 8$  solar mass) orbiting around a black hole or neutron star. HMXBs have bright OB-type stars that are detectable with telescope such as GAIA.
- Cygnus X-1 is the most well studied HMXB source. Matter from the supergiant collects as the black hole's disk. The disk emits X-rays **1000** times more powerful than our sun.
- The massive OB-type stars in HMXBs live for 10 millions years and are excellent tracers for star formation.
- By observing their position and velocity in the galaxy, HMXBs are found in spiral arms of the galaxy. Many young star clusters have the most massive stars in the galaxy.

## REFERENCES

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- [3] Carretero-Castrillo, M., Ribó, M., and Paredes, J. M., "Galactic runaway O and Be stars found using Gaia DR3", <i>Astronomy and Astrophysics</i>, vol. 679, Art. no. A109, 2023. doi:10.1051/0004-6361/202346613.