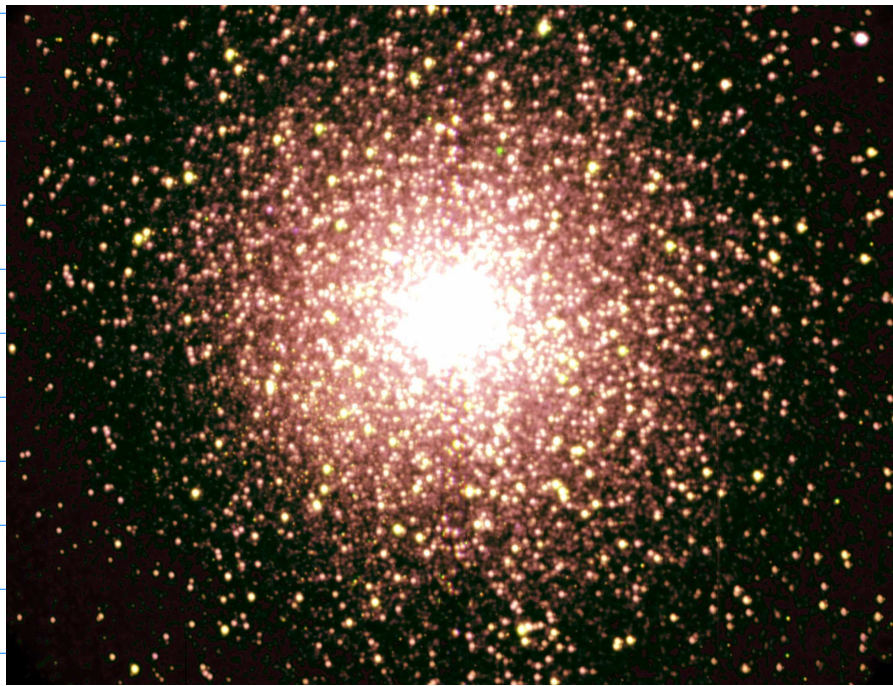


HARLOW SHAPLEY ESTABLISHED OUR LOCATION IN THE MILKY WAY



AFTER THE WWI BY MEASURING THE DISTANCES TO GLOBULAR CLUSTERS IN THE GALAXY.

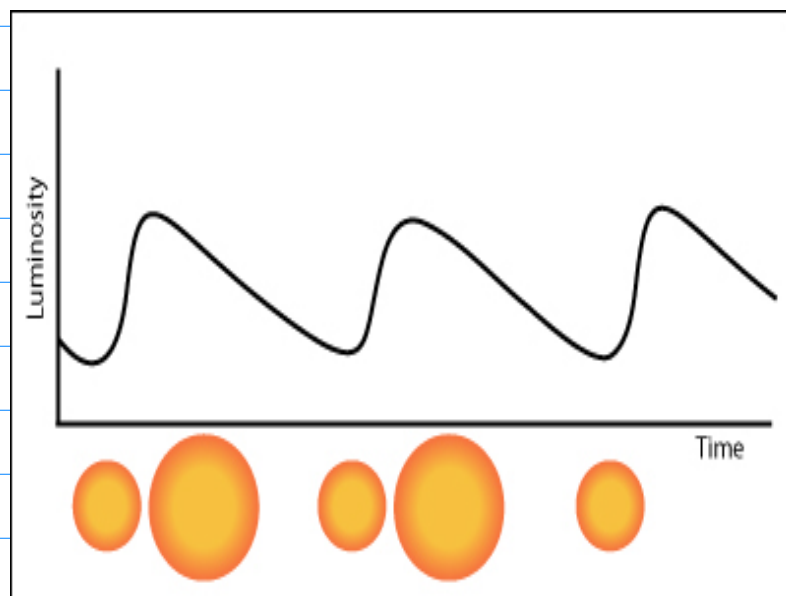


THEY CONTAIN FROM 100,000 TO 1,000,000 STARS AND ARE THEREFORE VERY BRIGHT AND ARE EASY TO SEE FROM LARGE DISTANCES.

HE USED THE METHOD OF CEPHEID VARIABLES PROPOSED BY HENRIETTA SWAN LEAVITT IN 1912.



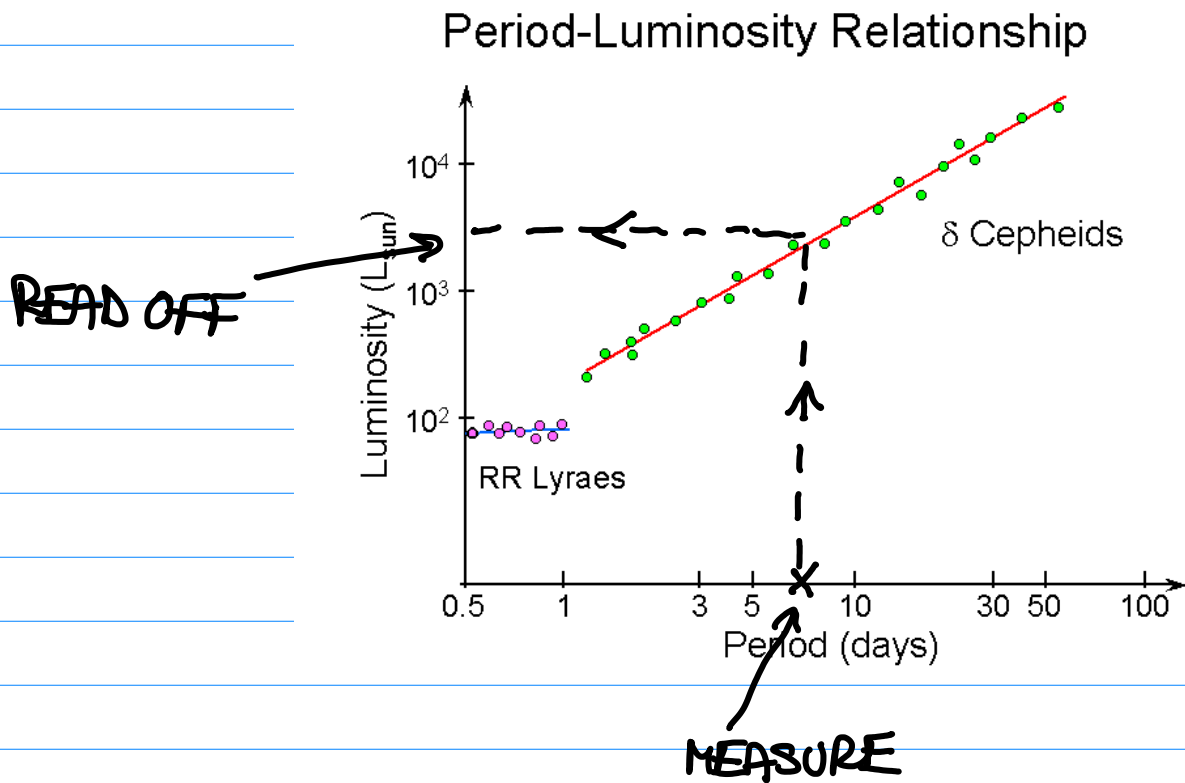
CEPHEID VARIABLES ARE PULSATING YELLOW GIANT STARS :



STEFAN-BOLTZMANN LAW:  $L = \text{CONST.} R^2 T^4$

$\uparrow$                        $\uparrow$   
 RADIUS                      TEMPERATURE  
 (CHANGES IN PERIODIC WAY)                      (CONSTANT)

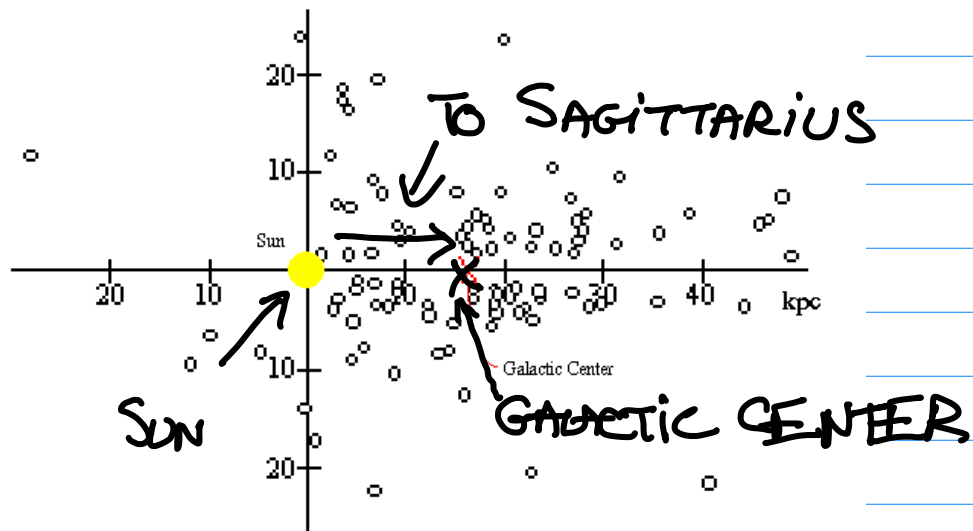
LEAVITT FOUND THE PERIOD-LUMINOSITY RELATION BY OBSERVING CEPHEIDS IN THE SMALL MAGELLANIC CLOUD (SMC) GALAXY:



WITH LUMINOSITY ( $L$ ) DETERMINED IN THIS WAY AND WITH MEASURED BRIGHTNESS ( $B$ ) ONE CAN FIND THE DISTANCE ( $d$ ) FROM

$$B = \frac{1}{4\pi} \frac{L}{d^2} .$$

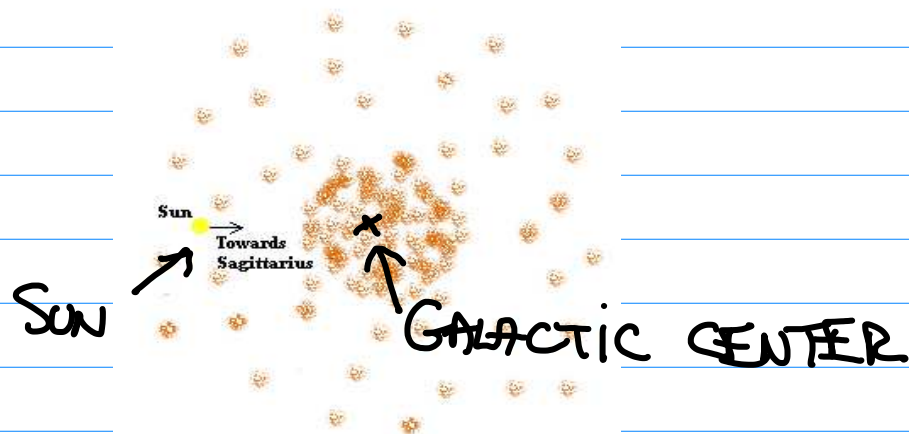
# MARLOW SHAPLEY'S RESULTS ON THE DISTANCES OF GLOBULAR CLUSTERS FROM US:



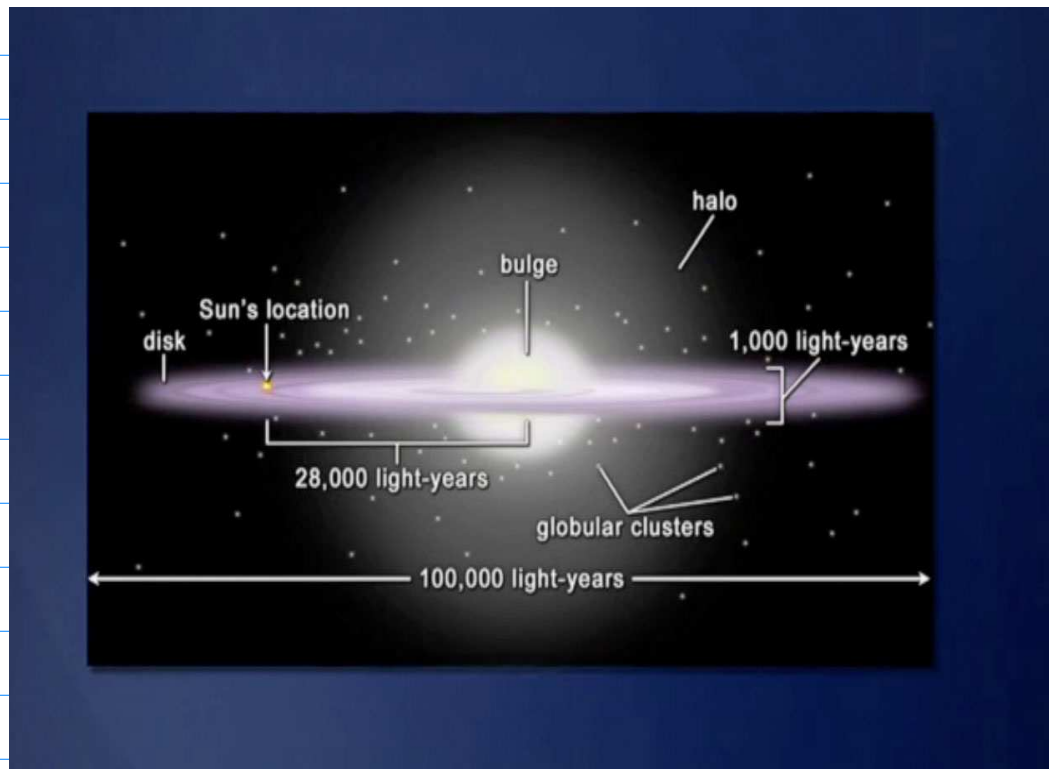
MORE THAN A HALF OF ALL GLOBULAR CLUSTER ARE FOUND IN THE DIRECTION OF SAGITTARIUS.

HE ARGUED (CORRECTLY) THAT THEY MUST BE DISTRIBUTED AROUND THE GALACTIC CENTER AS A RESULT OF GRAVITATIONAL PULL. HENCE WE (AND THE SUN) MUST BE SOME DISTANCE AWAY FROM THE GALACTIC CENTRE.

SHAPLEY'S MODEL :



USING THE MEASUREMENTS LIKE THESE WE NOW HAVE A PRETTY GOOD IDEA OF WHAT THE DIMENSIONS OF THE MILKY WAY ARE AND WHAT IS OUR DISTANCE FROM GALACTIC CENTER:

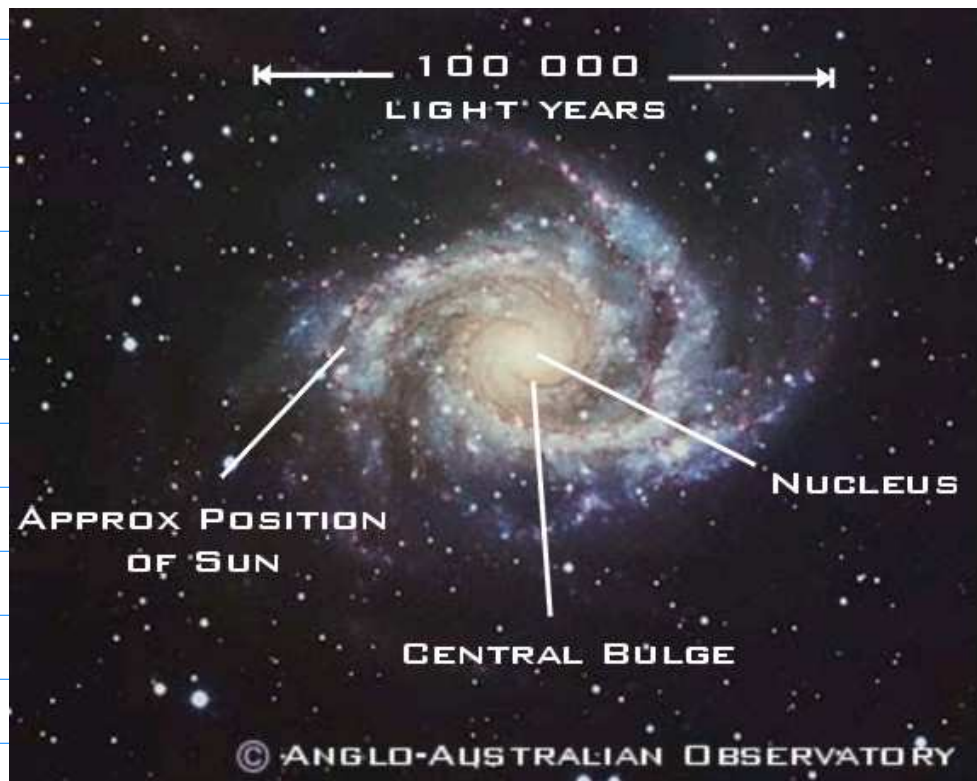


EDGE ON VIEW OF THE MILKY WAY

THE DIAMETER OF THE MILKY WAY DISK = 100,000 ly  
THE DISTANCE BETWEEN THE SUN AND THE GALACTIC CENTER = 30,000 ly

THE THICKNESS OF THE DISK IS FROM 1,000 ly (FOR O- AND B-TYPE LUMINOUS STARS) TO ABOUT 3,000 ly FOR STARS LIKE OUR SUN.

# THE TOP VIEW:



ALL OF THIS IS BASED ON VARIOUS OBSERVATIONS.