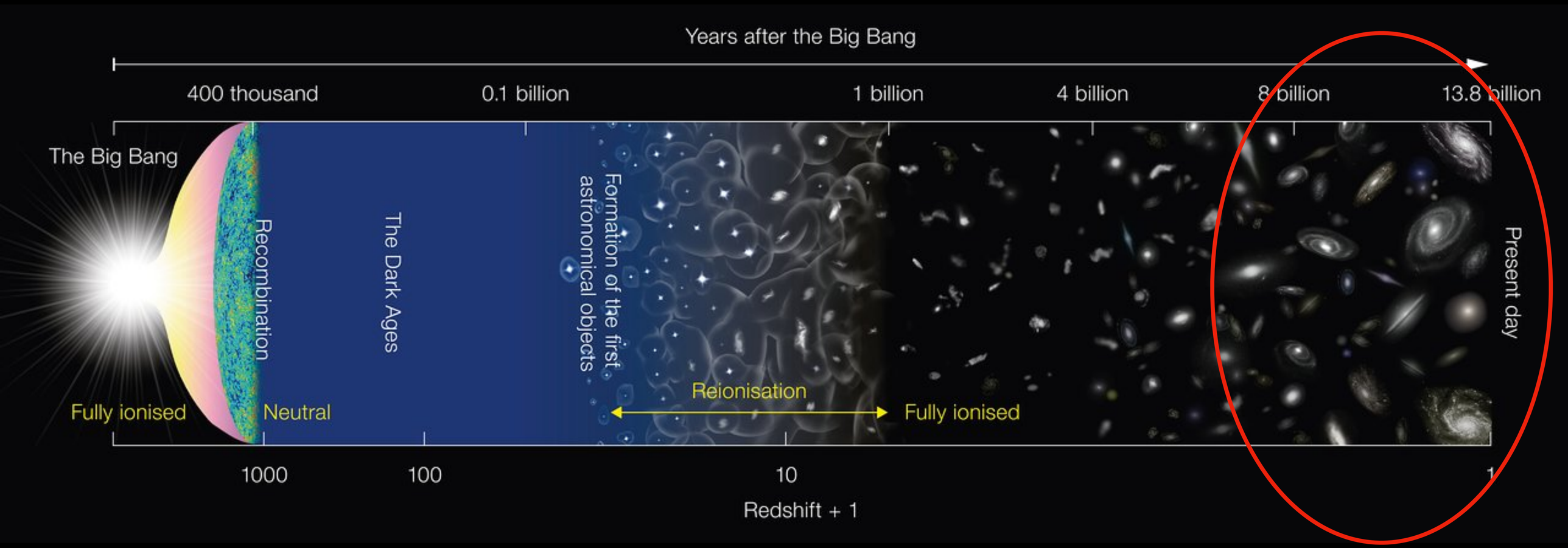
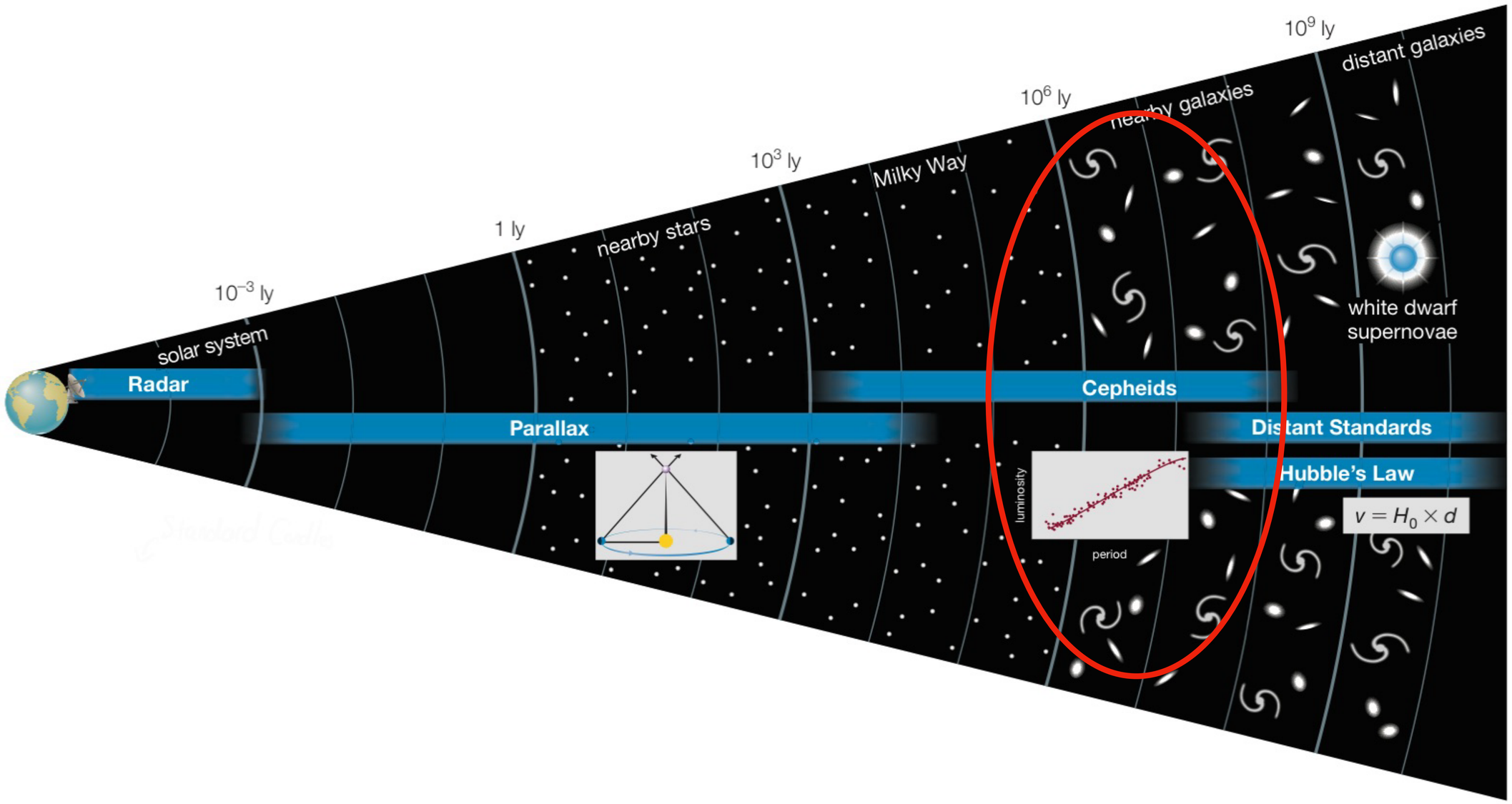


Image: National Observatory of Japan /EOS

The cosmic distance ladder



Cepheid Variable Stars


PLATE XVII

HENRIETTA SWAN LEAVITT
At about 30 years of age.

Henrietta Swan Leavitt (1868-1921)

American astronomer at the Harvard College Observatory

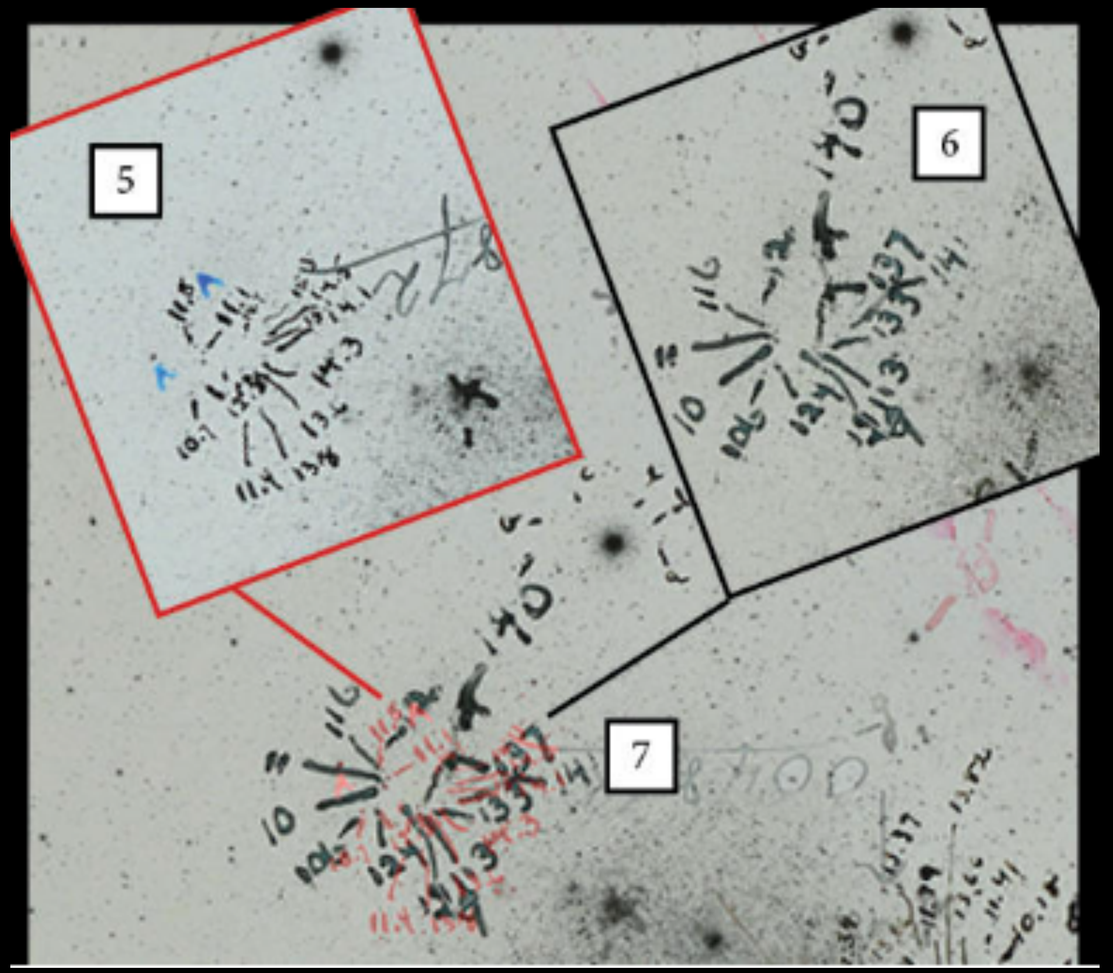
Famously discovered the relation between the luminosity and the period of brightening/dimming of Cepheid variables.

This became the first “standard candle” with which to measure the distance to faraway galaxies.

Cepheid Variable Stars

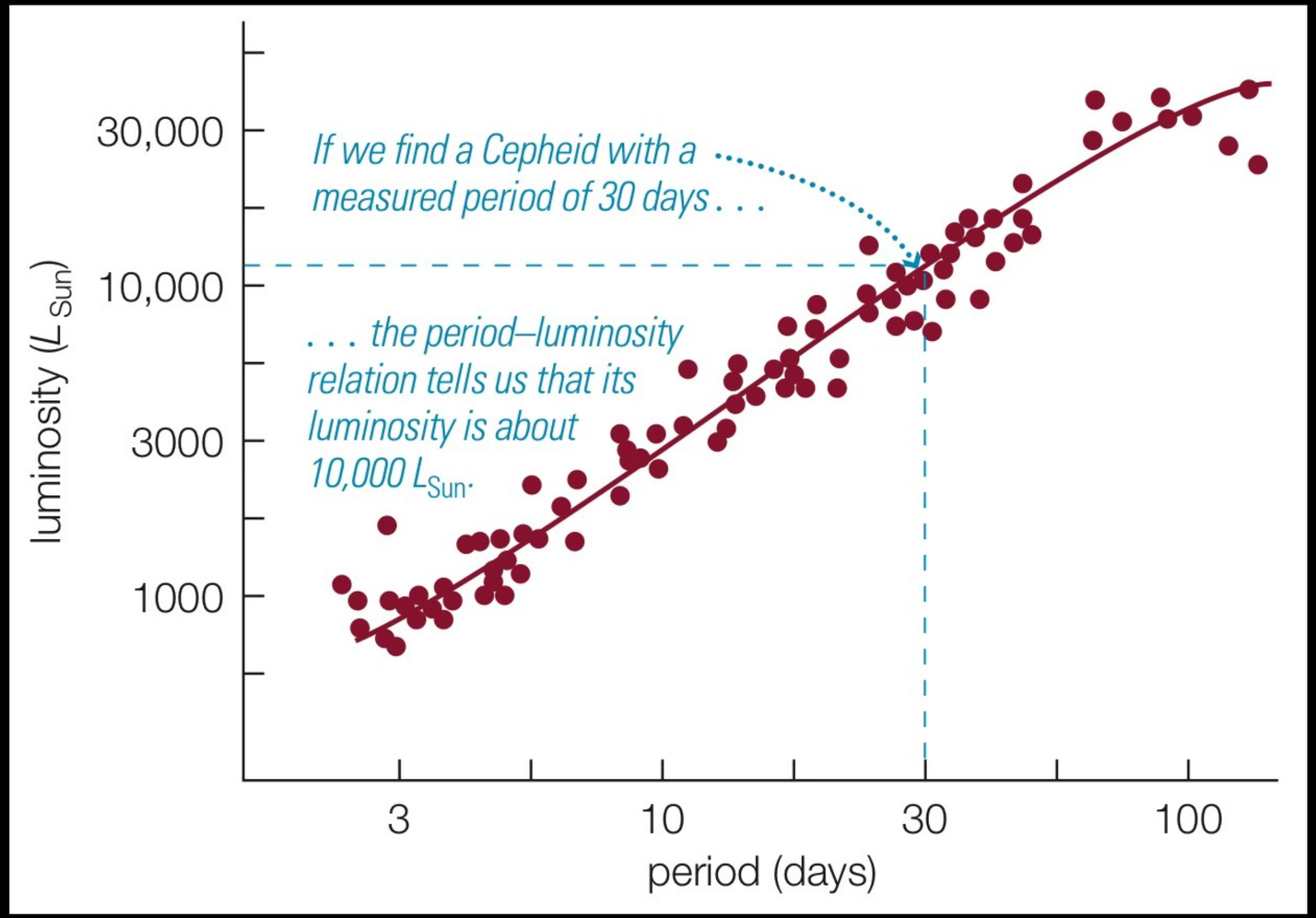
Five images of one section of sky
from different nights (four glass negatives
and a positive print of a fifth).

Overlaying each negative in turn on the
positive print led her to the discovery of the
variable stars.



Cepheid Variable Stars

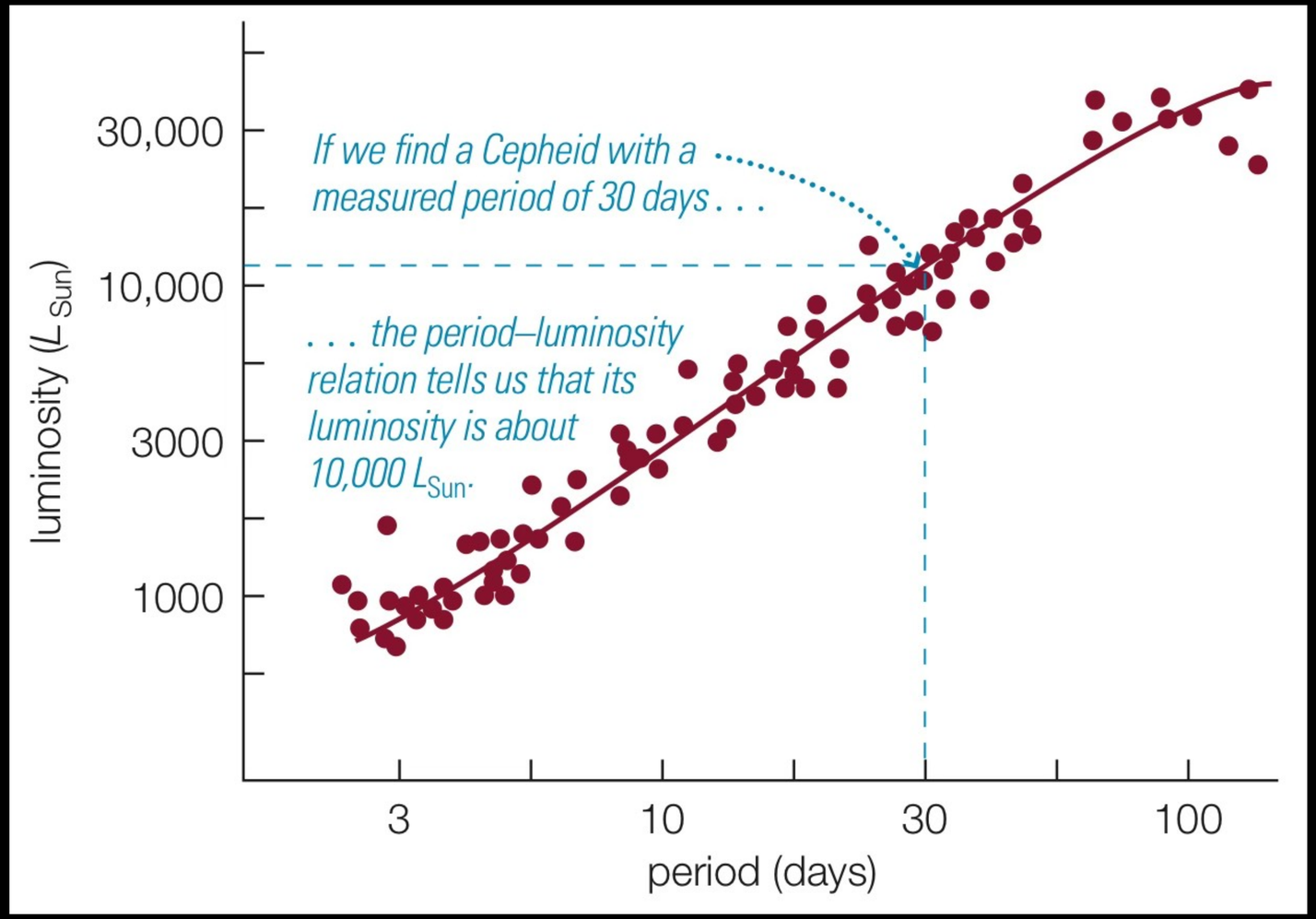
Leavitt Law



Cepheid Variable Stars

Leavitt Law

$$F_{\text{received}} = \frac{L_*}{4\pi d^2}$$



Hubble's Law

Edwin Hubble

Found cepheids in more distant galaxies, leading to his famous discovery.

$$F_{\text{received}} = \frac{L_*}{4\pi d^2}$$

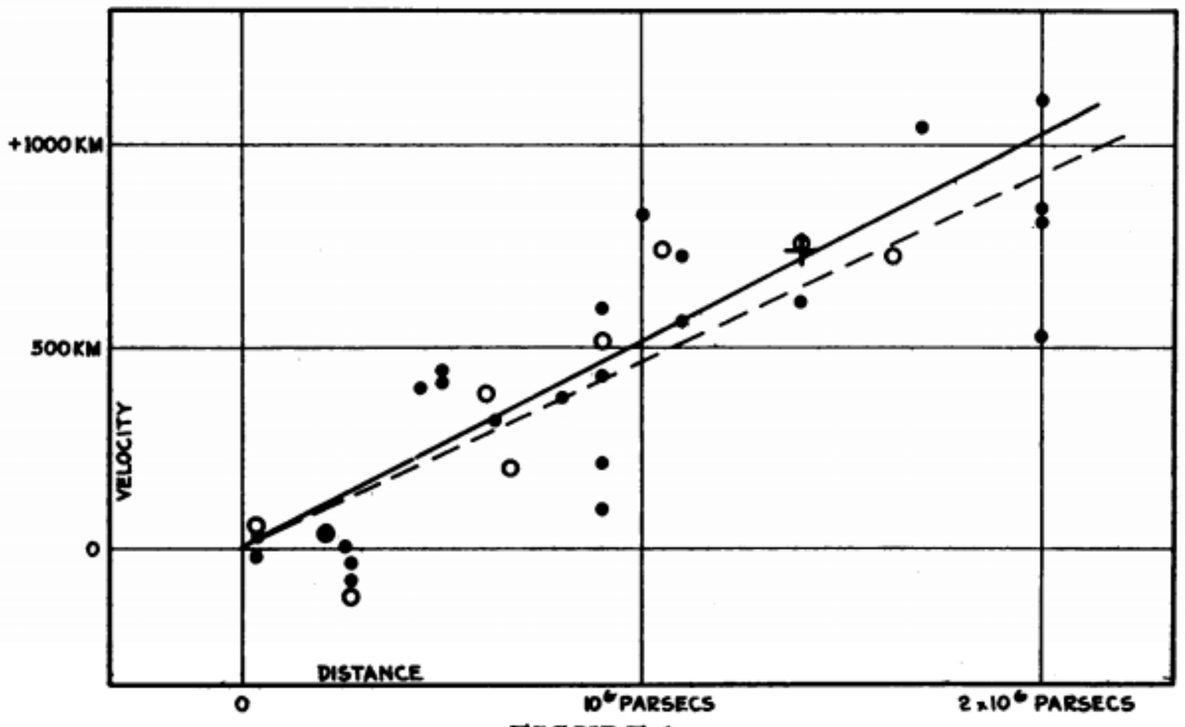


FIGURE 1

Velocity-Distance Relation among Extra-Galactic Nebulae.

Hubble's Law

Hubble's Law

$$v = H_0 d$$

In 1929 Hubble found
$H_0 \approx 500$ km/s/Mpc

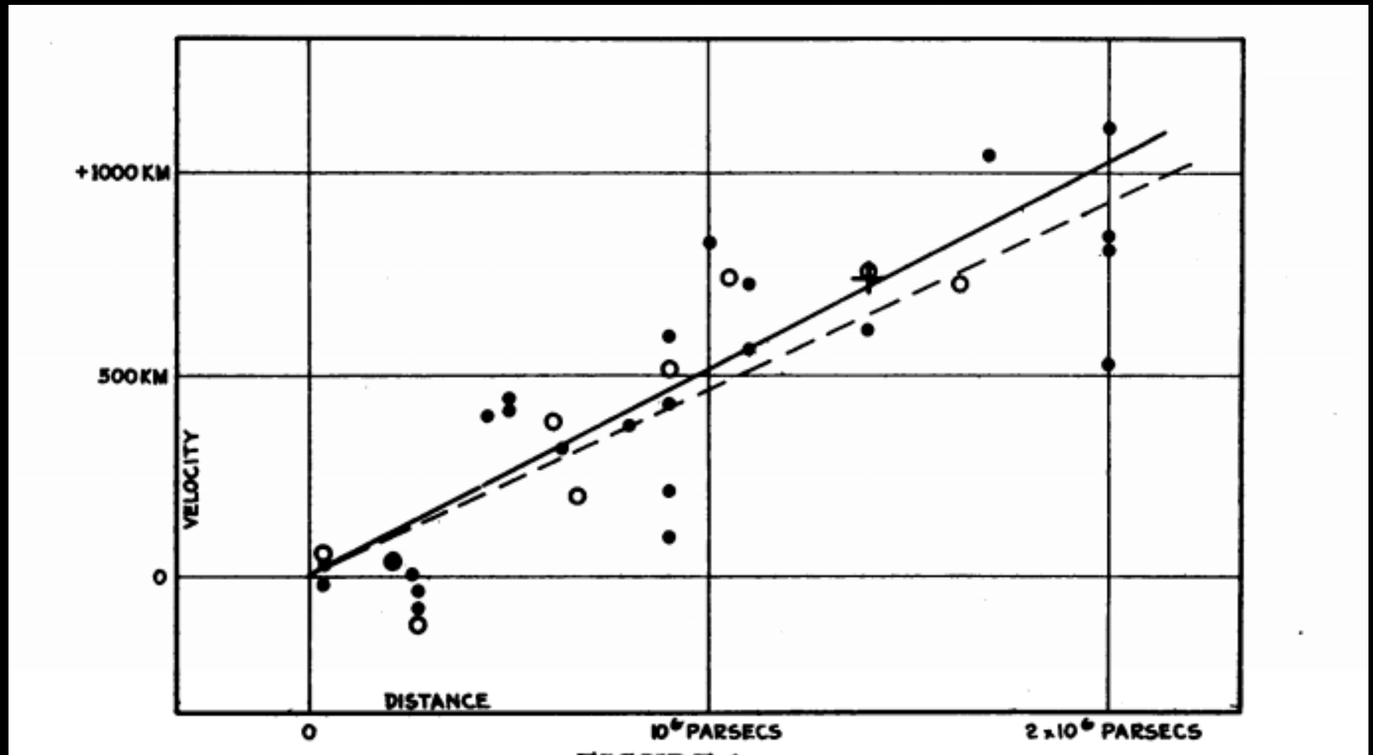


FIGURE 1

Velocity-Distance Relation among Extra-Galactic Nebulae.

Hubble's Law

How does this relate to redshift?

$$v = H_0 d$$

$$v = cz$$

$$z = \frac{H_0}{c} d$$

Hubble's Law

How does this relate to redshift?

$$v = H_0 d$$

$$v = cz$$

$$z = \frac{H_0}{c} d$$

Again, these are crude measurements.

But ok for local universe.