1.2 Size and Scale

PRE-LECTURE READING 1.2

- *Astronomy Today*, 8th Edition (Chaisson & McMillan)
- *Astronomy Today*, 7th Edition (Chaisson & McMillan)
- *Astronomy Today*, 6th Edition (Chaisson & McMillan)

VIDEO LECTURE

- Size and Scale[1] (24:45)

SUPPLEMENTARY NOTES

Speed of Light (c)

- $c = 3 \times 10^8$ m/s
- $c = 3 \times 10^5$ km/s

Light-Year (ly)

- 1 ly is the distance that light travels in 1 yr.

$$\text{distance} = \text{speed} \times \text{time} \tag{1}$$

- distance = 1 ly

  speed = c

  time = 1 yr

  distance = speed × time

$$\begin{aligned} 1 \text{ ly} &= c \times 1 \text{ yr} \\ &\approx (3 \times 10^5 \text{ km/s}) \times (\pi \times 10^7 \text{ s}) \\ &\approx 10^{13} \text{ km} \\ &= 10 \text{ trillion km} \end{aligned}$$

- distance to nearest star = 4.3 ly

[1] http://youtu.be/Zbg-w2liDJI

Absolute Size vs. Relative Scale

Object	Size	Scale
Earth	13,000 km	≈2.5 United States
Sun	1,400,000 km	≈100 Earths
Solar System	≈15,000,000,000 km	≈1,000 Suns
Local Stellar Neighborhood	≈10 ly	≈6,000 Solar Systems
Milky Way Galaxy	≈100,000 ly	≈10,000 Stellar Neighborhoods
Local Group of Galaxies	≈3,000,000 ly	≈30 Milky Way Galaxies
Large-Scale Structure	≈600,000,000 ly	≈200 Groups of Galaxies

EXERCISES

- Experiment with Google Earth[2].
- View Powers of Ten with Morgan Freeman[3] (8:35).
- Experiment with Interactive Powers of Ten[4].

ASSIGNMENT 1

Do Question 1.

[2]http://www.google.com/earth/index.html
[3]http://www.youtube.com/watch?v=qxXf7AJZ73A
[4]http://www.newgrounds.com/portal/view/589217