

## 2.1 SCALES OF THE UNIVERSE

|                                                                                                           |                                                                                                                                                                                                                                                                                                                                                   |                                                                                       |                                                                                              |                                                                            |
|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Oceans                                                                                                    | Oceans cover 70% of Earth at an avg. dept of 2.5 miles<br>How many humans? 10 billion times the number of people alive today                                                                                                                                                                                                                      |                                                                                       |                                                                                              |                                                                            |
| Earth                                                                                                     | Oceans fit in the ‘hollow’ of your palm (Earth=basketball)                                                                                                                                                                                                                                                                                        |                                                                                       |                                                                                              |                                                                            |
| Planets & Stars                                                                                           | 1300 Earths in <b>Jupiter</b>                                                                                                                                                                                                                                                                                                                     |                                                                                       | 1000 Jupiters in <b>Sun</b>                                                                  |                                                                            |
|                                                                                                           | ~16,000 Suns in <b>Arcturus</b>                                                                                                                                                                                                                                                                                                                   |                                                                                       | 300-500 million Suns in <b>Antares</b>                                                       |                                                                            |
| Distances in the Solar System                                                                             | <b>Moon.</b> 1.3 l sec.                                                                                                                                                                                                                                                                                                                           | <b>Sun.</b> 8.3 lmin.                                                                 | <b>Edge of Solar System.</b> 10-30 lhrs                                                      | <b>Nearest stars.</b> 4.24-4.37 ly                                         |
|                                                                                                           | <b>Edge of our galaxy.</b> ~27,000 ly                                                                                                                                                                                                                                                                                                             | <b>Width of Milky Way</b> is ~105,000 ly                                              | <b>Nearest galaxy.</b> 2.537 Mly                                                             | <b>‘Width’ of the Universe.</b> ~93 Gly                                    |
| Scale. Sun is a 12” ball ( <b>4.6 billion times smaller</b> ; 1 ft = 864,000 miles = 1.4 Mkm)             |                                                                                                                                                                                                                                                                                                                                                   |                                                                                       |                                                                                              |                                                                            |
| Sizes of Planets                                                                                          | <b>Mercury.</b> Point of a pushpin                                                                                                                                                                                                                                                                                                                | <b>Venus.</b> Just smaller than a peppercorn                                          | <b>Earth.</b> Just smaller than a peppercorn                                                 | <b>Mars.</b> Head of a pushpin                                             |
|                                                                                                           | <b>Jupiter.</b> Golf ball                                                                                                                                                                                                                                                                                                                         | <b>Saturn.</b> ~20% size of a golf ball                                               | <b>Uranus.</b> Large marbles                                                                 | <b>Neptune.</b> Large marble                                               |
| Distances in the Solar System                                                                             | <b>Mercury.</b> 41.6 ft (depth of ROM 172)                                                                                                                                                                                                                                                                                                        | <b>Venus.</b> 78 ft (just outside ROM)                                                | <b>Earth.</b> 106 ft (almost to the library)                                                 | <b>Mars.</b> 162 ft (in the library learning how to be a habitable planet) |
|                                                                                                           | <b>Jupiter.</b> 555 ft (in the MC, taking a test on big numbers)                                                                                                                                                                                                                                                                                  | <b>Saturn.</b> 1019 ft (headed into Taylor bldg. for a lecture on Egyptian astronomy) | <b>Uranus.</b> 2032 ft (headed S out of the biology bldg.. after an anatomy lab ... get it?) | <b>Neptune.</b> 3200 ft (walking up 7th south on a windy day)              |
|                                                                                                           | <b>Pluto.</b> 4200 ft (lost in the field S of temple)                                                                                                                                                                                                                                                                                             | <b>Kuiper Belt.</b> Inner Edge. Neptune’s orbit                                       | <b>Edge of Sol. Sys.</b> = Heliopause (Walmart). Oort cloud (Greenland)                      | <b>Next Star.</b> Eiffel Tower                                             |
| Scale. Sun is a candy sprinkle. 12” ball ( <b>~600 million million times smaller</b> ; 6 E-14)            |                                                                                                                                                                                                                                                                                                                                                   |                                                                                       |                                                                                              |                                                                            |
| Distances in MW Galaxy                                                                                    | <b>Size of Sol. Sys.</b> Palm of hand                                                                                                                                                                                                                                                                                                             | <b>Next Star.</b> 4 Football fields                                                   | <b>Width of Milky Way.</b> 2x N Amer                                                         | <b>Thickness of MW.</b> ~80 miles                                          |
| # of Stars in MW Galaxy                                                                                   | <b>~200 billion stars.</b> Fill 15 large yellows school buses with sprinkles or A space a bit bigger than ROM 172                                                                                                                                                                                                                                 |                                                                                       |                                                                                              |                                                                            |
| Scale. Milky Way is a DVD (~100x wider than thick; <b>~13 billion trillion times smaller</b> ; ~1.3 E-22) |                                                                                                                                                                                                                                                                                                                                                   |                                                                                       |                                                                                              |                                                                            |
| Galactic Distances                                                                                        | Distance to Nearest large Galaxy (Andromeda; ~2.5 Mly). <b>~8ft</b>                                                                                                                                                                                                                                                                               |                                                                                       | Average Distance between Galaxies (~10 Mly). <b>~80ft</b> (~2x depth of ROM 172)             |                                                                            |
| Sizes of Galaxies                                                                                         | <b>Smallest</b> (ex:Segue2). MW/~1000=~0.13 mm. A bit smaller than a <b>BB</b>                                                                                                                                                                                                                                                                    |                                                                                       | <b>Largest</b> (e.g., IC 1101). ~20 x MW = ~2.5m. ~size of <b>Playground Merry-go-round</b>  |                                                                            |
| The Universe                                                                                              | <b>Size. A Sphere ~size of Rexburg to Pocatello</b> (~70 mile diameter)<br><b>Several hundred billion BB to DVD to Merry-go-round objects</b> distributed in the sphere—with objects <b>concentrated at nodes, along filaments, and in sheets surrounding large voids</b> (like placing the galaxies where the matter is in a very ‘open’ sponge. |                                                                                       |                                                                                              |                                                                            |