How far is it?

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Much of Science Fiction involves space travel. It could be travel between planets, stars or galaxies. The travel may be by multi-generation "slow-boats," near-lightspeed transports, supra-lightspeed ships or instantaneous transit jump-stations, but regardless of the techno-magical means, travel is usually involved. Why the fancy technology? Because the distances between planets, between stars and between galaxies are immense. But as my daughter asks, "how far is it?"

While it is convenient to use Astronomical Units (AU) as the local yardstick to measure the distances between planetary orbits and Light Years (LY) as the measure between stars, neither measure gives me the sense of how far, far really is.

Due to an accident of birth, I find myself most comfortable with the English measures of feet and miles. And while I can do the math, I find that 5,878,512,000,000 miles or one LY is such a large distance that I cannot imagine how big it really is.

I find that when numbers become too big or too small, I get a better understanding if I scale the problem. So lets scale a portion of our local universe so that one scale foot represents one million miles.

Name	Diameter (inches)	Distance (feet)
Sun	10.368	-
Mercury	0.0361	35.974
Venus	0.0910	67.207
Earth	0.0950	92.956
Mars	0.0506	141.665
Jupiter	1.0440	483.649
Saturn	0.8640	886.799
Uranus	0.3720	1783.823
Neptune	0.3960	2795.183
Pluto	0.0444	3668.038

In our scaled universe, our sun is a little larger than a basketball. (A basketball is 28.5 inches in circumference or about 9 inches in diameter.) Nearly ninety-three feet away, the earth's diameter is a little more than 3/32 of an inch. On my 14" monitor the zero in the 10 point Times New Roman font is about 3/32 of an inch tall.

The moon is 0.02592 inches diameter. Its orbit looks like a slightly squeezed circle that averages 5.73 inches in diameter. The center of the moon's orbit is within our miniscule earth.

Over 161 yards away from our sun is Jupiter. Hold up a 3.5 inch floppy disk so that you are looking its circular button. The circular cutout in which the button is recessed is about Jupiter's diameter.

Pluto is almost twice the diameter of the moon and less than half the size of the Earth, but it is almost seven tenths of a mile from the sun.

What about the stars?

Star	LY	scaled distance in miles	Radius Sun ref'd	Scaled diameter in inches
Alpha Centauri	4.3	4,787.42	1.23	12.75
Barnard's star	5.9	6,568.79	?	
Sirius	8.7	9,686.18	1.76	18.25
Procyon	11.4	12,692.24	2.17	22.50
Altair	16.0	17,813.67	1.65	17.11
Fomalhaut	23.0	25,607.15	1.56	16.17
Vega	26.0	28,947.22	3.00	31.10
Pollux	35.0	38,967.41	?	
Arcturus	36.0	40,080.76	23.00	238.46
Capella	45.0	50,100.95	?	
Aldebaran	64.0	71,254.69	36.00	373.25
Algol	82.0	91,295.07	?	
Mizar	88.0	97,975.20	?	
Canopus	110.0	122,469.00	25.00	259.20
Spica	260.0	289,472.18	8.00	82.94
Betelgeuse	650.0	723,680.45	420.00	4,354.56
Mira	820.0	912,950.73	?	
Rigel	850.0	946,351.36	78.00	808.70
Deneb	1500.0	1,670,031.82	?	

In our scaled universe the closest star is almost five thousand miles away. If our sun were located in Houston Texas, the Centauri system would be about 700 miles south of Santiago Chile (South America). The stars are balls than range in size from a few inches to hundreds of feet in diameter, but thousands of miles apart.

What about the galaxy?

Object	LY	scaled distance in miles
Galactic center	30000	33,400,636
Galactic diameter	100000	111,335,454
Galactic thickness	2000	2,226,709
M31 Andromedia Galaxy	2.20E+06	2,449,380,000

The galactic center is a long way off. Even in our scaled universe it is more than 33 million miles away. That's nearly the distance from the Sun to Mercury in the real world. With a radius of over 55 million miles, our scaled galaxy would fit neatly within the orbit of Venus in the real universe.

And a nearby galaxy? Two and a half billion miles is nearly the distance from the Sun to Neptune's orbit in the real world.

Vast distances true, but how "far is it" means nothing unless you also ask, "how fast is it?" The speed of light in our scaled universe is 2.28 inches per second or 11.4 feet per

minute. That's slow! And thus the need for the techno-magical transports of science fiction.

Anyone have a used supra-light speed ship with a good warranty?

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