APPARENT MAGNITUDE

Two thousand years ago the idea of APPARENT MAGNITUDE was a way to identify the brightness of a star from our perspective here on earth.

The brightest stars were categorized as FIRST MAGNITUDE stars.

The next brightest stars were categorized as SECOND MAGNITUDE stars.

The least brightest stars were categorized as SIXTH MAGNITUDE stars.

Considerably later, it was noticed that this span of five magnitudes constituted an energy flux range of 100. That is, a first magnitude star is 100 times more energetic, as measured by ENERGY FLUX, than is a sixth magnitude star.

If a brightness increase of 5, as measured with our eyes (i.e., in increase from magnitude one to six), corresponds to an energy flux increase of 100, it stands to reason that a jump from any one magnitude to the next will see an increase in energy flux of 2.5 times.

Put a little differently, the increase in energy flux between any two stars is equal to $(2.5)^{(b-a)}$, where "b" and "a" are the magnitudes of the stars in question.

Example: The flux difference between a first and a third magnitude star is

$$(2.5)^{(3-1)} = (2.5)^{2} = 6.25$$

Interesting note about your eyes: Your eyes have a logarithmic sensitivity response. That is, the firing rate of an eye's neurons is proportional to the LOG of the brightness. So if the brightness goes up by a factor of 1000 (that is, it goes from, say, "10" to "10,000"--this is an increase of a factor of 10^3), the firing rate will go up by a factor of only "log (10^3)" = 3. If this wasn't the case, you and I wouldn't be able to negotiate activities under moonlight as well as we do under sunlight.

The sun has an apparent magnitude of -26.8. (Remember, a star with apparent magnitude "1" is really bright; a star with apparent magnitude 6 almost unseeable . . . smaller is brighter.

Alpha Centauri has an apparent magnitude of 0.

The Hubble telescope can see stars whose apparent magnitude is as little as 30.

ABSOLUTE MAGNITUDE

A star's ABSOLUTE MAGNITUDE is its *apparent magnitude* if it were 10 parsecs (33 light years) from us.

On this scale, the sun has an absolute magnitude of 4.8.

Because absolute magnitude is scaled to apparent brightness at 10 parsecs, absolute magnitudes can be used as a measure of a star's luminosity. The smaller a star's absolute magnitude, the more energy the star is putting out.