

Magnitude versus Surface Brightness

Log: Dec 22, 2003

Well, I finally learned the lesson on the difference between Magnitude and Surface Brightness, after spending 3 days trying to find M33 (the pinwheel galaxy) with my 10x50 binoculars.(I had decided to try one of the "tougher" Messier objects!hmmmm.....maybe I will put this off until later!)

Anyway, after not being able to see it even though I was positive that I was in the right place, I had to bone up on surface brightness. It seems that the "Surface Brightness" of this galaxy is 14.2 (from the SAGUARO ASTRONOMY CLUB DATABASE VERSION 7.2) as opposed to its Magnitude of 5.7!

Which explains why I couldn't see it! In the urban light polluted skies around Houston, there isn't any way to see a 14.2 surface brightness object in using a 50mm objective lens. Its going to take something much bigger to gather enough light to actually visually see it.

What is the difference between Magnitude and Surface Brightness? Well, here is a little example to help you understand it... shine a flashlight at a wall from about 5 feet away. See the spot it makes...that's surface brightness! Now, start walking towards the wall and notice the spot get smaller and brighter. When you get to about 3 inches, that's magnitude!

The amount of light being delivered by the flashlight hasn't changed at all during this experiment, just the area of the wall in which it is being displayed. As the area gets smaller, the same amount of light is being "crammed" into a smaller area. The "brightness" of the spot is really controlled by the size of the spot.

For a star, the "spot" is essentially a single point given the large distances of space. However, for larger space objects, particularly galaxies, the "magnitude" of the galaxy is spread out over an area that is considerably larger than a point. The brightness is diminished accordingly.

I haven't yet found the formulae for the calculation of surface brightness as a function of magnitude and size of the object, but I am hoping to find them eventually in order to examine the effects in more detail.

Henry Norton
Dec 22, 2003
Houston, Texas