

### Offered Title: It's Full Of Galaxies!

"It's full of stars"! This exclamation from the character Dr. David Bowman in the 1968 movie *2001: A Space Odyssey* evokes a sense of the infinite.

From an astronomical perspective his statement gives a clue to his general location. He's still within a galaxy or maybe a globular cluster. At least he starts out among stars, but as the film segment continues it gets quite philosophical, metaphorical, and metaphysical. I'm not touching that.

Why am I confident Dr. Bowman is within a globular star cluster or galaxy? If he were in intergalactic space, unless he was very close to a galaxy, his view would be that of smudges. These smudges would be galaxies. While inter-galactic space does have stars, they are sparse and scattered so individual stars would be seen only if you're close enough, and/or the star is sufficiently bright.

So, the view in intergalactic space is way different than from within a galaxy or globular cluster. I vote that Dr. Bowman was pulled into a globular cluster simply due to the high density of stars surrounding him. Globular clusters are dense, spherical collections of stars at the outer regions of galaxies. Unless he had eyes as sensitive as the Hubble space telescope all he would see in intergalactic space would be a smattering of dim smudges.

It's full of galaxies. The big eye of Hubble and long photographic exposures bring into focus thousands of galaxies in what appears to be a tiny amount of empty space. That's the Hubble Deep Field photo and it is amazing! Our visible universe is built with galaxies.

The word galaxy comes from the Greek description of milk or milky appearance – hence Milky Way. Galaxies form the largest individual structures in our universe, and they cluster too. So, within a galaxy stars cluster, and the galaxies themselves cluster. Our Milky Way galaxy is part of a cluster called the Local Group, which includes M33 (the Pinwheel) in Triangulum, M31 in Andromeda, and others. Our local group is thought to be part of a supercluster named the Laniakea Supercluster.

If we could stand way back and look at our universe with super sensitive eyes we might see what looks like a matrix, with galaxy clusters and superclusters forming interconnecting webs. We would also see what appear to be large bubbles of empty space. This is how gravity and dark matter act to form large scale structure in our universe. The first time I saw this structure depicted in a computer-generated graphic I was reminded of my clinical microbiology days. This is how a stained sputum specimen appears in a microscope. Mucus as gravity and dark matter, various cells and bacteria as the galaxy clusters. A matrix of interconnecting webs and seemingly empty spaces. Kind of eerie.

### What's in the Sky?

February 2-16: Look west after sunset, see a hazy triangle of light pointing upward? That's zodiacal light. Dust in space.