Wayne's View:

Where Space Comes From

Topic 050 Article 7 **February 5, 2003**

By Wayne Halm

Introduction

Astronomy is becoming The Dark Science. A while back it invented "Dark Matter" and more recently "Dark Energy". Dark Matter is an invisible undetectable something that holds galaxies together - gravity alone doesn't seem to be up to the task anymore. Dark Energy is a mysterious unknown something that pushes galaxies away from each other - sort of an anti-gravity thing. Neither have ever been seen, touched, tasted, heard, or detected in any way by any instruments - only computer models of the universe are able to locate them.

Of course both Dark Matter and Dark Energy do exist - they are just not as mysterious and ominous as the names imply. This article will explain Dark Energy and the "Where Space Goes" article will explain Dark Matter. Once both are understood the models can be adjusted and we can get on with the exploration of the universe.

The Need for Dark Energy

A while back a man named Hubble was looking at spectrographs of light from various galaxies. He noticed that the spectrographs from galaxies considered more distant were shifted toward the red end of the spectrum. He explained this shift as the Doppler Effect and concluded that the galaxies are moving away from the Earth and the Universe is expanding.

Others refined Hubble's measurements and mathematically reversed the expansion to conclude that at sometime 10 to 20 billion years ago everything was in the same place. Obviously everything is not in the same place now, something was needed to get us from there to here - the "Big Bang" was invented. This theory holds that everything exploded out of this one point and has been flying apart ever since.

But 10 to 20 billion years is a wide range, people wanted to do better, so they refocused their efforts on the measurements. The refined measurements presented something startling - the Universe was not only expanding, it was expanding at an ever greater rate. This was a problem, something had to be driving this ever increasing rate, something had to be actively pushing the galaxies apart, something the opposite of gravity. To solve this little problem Dark Energy was invented.

Something Forgotten

The increasing rate of expansion is a problem for the Big Bang, but it's not the first problem the theory has had. Early on it was noted that some galaxies had to travel impossibly fast to get the observed distance between them in the allotted time. (The old 186,000 mile per second speed limit caused a paradox.)

To get around the current impossible placement of the galaxies a brilliant idea was advanced. Along with everything else created from the starting point during the Big Bang, space itself was created. This was fantastic, the galaxies didn't have to move impossibly fast to get to their current locations, the space between them was simply created. This gave us those great visuals of "the raisins in the pudding" and "the dots on the balloon". Since it happened during the chaotic and unimaginable conditions of the Big Bang, no real explanation had to be given. Perfect.

The simple creation of space was used to move the galaxies into their otherwise illogical positions. But then it's usefulness faded and it was more or less forgotten - after all it was part of the Big Bang and now over with.

Something Ignored

Something ignored? Well, seemingly so anyway. There is the perplexing little

problem of direction. The only major direction of galaxy movement that can be determined is "away from the Earth". Since the Earth has already been tried as the center of the Universe, and didn't work out too well in that role, some other explanation is needed.

Of course, if it's not ignored, the explanation is already in place. "The simple creation of space" solves the problem. It didn't stop with the Big Bang, it's still going on, new space is constantly being created everywhere. Everything isn't moving away from the Earth, more space is simply being created between everything and everything else (the Earth included - so everything appears to be moving away).

Where Space Comes From

"The simple creation of space" is easy to write but how do you actually build some of the stuff? It's easy to do. To start creating new space simply turn on a light bulb. Space is a by-product of the decay of light - actually until the light strikes some matter, it is the by-product. (By "light", I'm referring to all radiant energy across the spectrum.)

Light begins to decay the instant it is created, and continues to decay as it travels through the existing space. With each mile traveled a tiny amount of light decays creating a tiny amount of new space and leaving the remaining light with a slightly longer frequency. The longer it travels the longer the frequency gets, this is the shift that Hubble observed. Light that later travels the same path has both the old space and the new space to cross, so it must go even farther, creating even more space, and arriving with an even longer frequency shift (viewed as an ever greater rate of expansion).

Of course the amount of radiant energy produced by a light bulb is relatively small, and the cumulative effects of decay before the energy strikes the wall is tiny. So the amount of new space created is too minuscule to be measured.

But the radiant energy output of billions of stars is enormous, and the cumulative effects of it's decay across billions of trillions of miles is huge. The amount of new space being created is staggering. All of the radiant energy, from every source, traveling in every direction, is constantly decaying and creating new space everywhere. Just measuring space, everything appears to be moving away from everything else.

So it's not some mysterious Dark Energy that is pushing the galaxies apart - it is simply the decay of the light energy created by the galaxies themselves.

Can Space Creation be Verified?

Yes, and I expect that shortly it will be. The National Science Foundation is funding the construction of a huge machines called LIGO (Laser Interferometer Gravitational-Wave Observatory) to verify the existence of gravity waves (actually two are being built). Basically this instrument will use lasers to measure the distance between a source and two targets very accurately. The targets will be positioned so that the laser paths are at a right angle to each other, and each path encased in a steel pipe with all of the air pumped out. The idea is that a passing gravity wave will change the distance to one target more that to the other, this change can then be measured and analyzed.

These will be fine and sensitive instruments, but difficult to keep calibrated. Calibration will be a problem until the calibrators realize that the decay of the laser light itself is creating more space within the pipe and changing the distance. Then they will refocus and begin to investigate this more interesting phenomenon.

What about the Doppler Effect?

The Doppler Effect still works. Besides Astronomers I know of three other groups that make use of it, traffic police, the military, and weather forecasters. They are all doing a fine job with it (well, two out of three anyway).

Where Space Comes From

The Doppler Effect may explain certain specific red shift occurrences. It is still valid, it's just not what moves galaxies around that's all.

###