Physics – Is Empty Space Really Empty?

JOB 26:7 HE SPREADS OUT THE NORTHERN SKIES OVER EMPTY SPACE; HE SUSPENDS THE EARTH OVER NOTHING.
Why explore the emptiness?

- Genesis 1:2
  - The earth was formless and *void*, and darkness was over the surface of the deep, and the Spirit of God was moving over the surface of the waters.

- Job 26:7
  - He spreads out the northern skies over *empty space*; he suspends the earth over *nothing*.

- Colossians 1:16
  - For by Him all things were created that are in heaven and that are on earth, *visible and invisible*.

- Joseph H. Taylor, Jr. - 1993 Nobel Prize in Physics for the discovery of binary pulsar, and for his work on the Big Bang theory.
  - “There is no conflict between science and religion. Our knowledge of God is made larger with every discovery we make.”
What is in the emptiness

- Until the 1920s physicists viewed the vacuum of space much as the rest of us still do: as a featureless nothingness, a true void.
  - The definition of a vacuum: the lowest-energy situation possible - less energy than anything else.

- Space near to us is considered a high vacuum, with just a few hydrogen atoms per cubic meter on average.

- But even these few particles would be gone in very deep space, between galaxies...

  ...or so we thought.
Astronomers, in 1996, pointed the Hubble Space Telescope into a part of the sky that seemed empty. Over the course of 10 full days, photons that had been travelling for over 13 billion years were collected on the detector of the telescope.

**JEREMIAH 4:23**

I looked on the earth, and behold, it was formless and void; and to the heavens, and they had no light.
What is in the emptiness

- Large Hadron Collider (LHC) will begin accelerating protons at 99.99% the speed of light in opposite directions along a circular, 17-mile course to find evidence of a component of empty space - the **Higgs Field**.

- Physicist Peter Higgs proposed its existence in 1964 and it is thought to permeate all of space.

- As particles interact with the invisible Higgs Field, we interpret the strength of this interaction as a particle’s mass just as weight is an interaction with gravity.

- If it exists, the LHC should find a particle called the Higgs boson.

- The Higgs field’s existence, part of the Standard Model of particle physics is now believed to be confirmed 4 July 2012 at CERN’s LHC with the discovery of the Higgs boson (the “God Particle”).
What is in the emptiness

- **Quantum Mechanics** has the space around a particle filled with countless “virtual” particles bursting into and out of existence – *which is energy*.

- In 1977, a physicist measured the **Casimir Force** (named after Dutch physicist Hendrik Casimir) between two small surfaces separated by a few thousandths of a millimeter. Its strength was about equal to the force that would be exerted against the palm of one’s hand by the weight of a single red blood cell.

- When physicists use the equations of quantum theory to calculate the amount of that virtual energy, they get a ridiculously huge number (about 120 orders of magnitude **too large**).

- *That much energy would blow the universe apart, so...*
The mass of the universe

... since we are not flying apart, something is keeping us together?

By fitting a theoretical model to the cosmological observations, scientists have calculated the composition of the Universe.

- We find that normal matter is less than 5% of the total energy density of the Universe.
- Dark Stuff is 95% of the Universe.

http://universe-review.ca/.
What is in the emptiness

- The observational evidence:
  - Astronomers thought the expansion of the cosmos should be slowing down because gravity was *thought* to slow the expansion over time.
  - Then came 1998 and the Hubble Space Telescope (HST) observations of very distant supernovae showed that, a long time ago, the Universe was actually *expanding more slowly than it is today*.
  - Some postulated explanations: Einstein’s gravity theory needs a cosmological constant, or some strange stuff fills space, or a new field theory is needed.

- **Dark Energy** (a minuscule amount of energy for every cubic meter of vacuum) combined with **Dark Matter** is what we call the solution.

- Seems to be countering the gravitational pull of gravity and pushing everything in the universe apart.

- Dark Energy is theorized to permeate all of space and Dark Matter is composed of exotic particles.
Effects on the really large

Dark Energy doesn’t only have an energy density, it also has a negative pressure doing negative work (it’s what the math and physics tell us).

Dark Energy isn’t an extra force, just one aspect of General Relativity and is part of the force of gravity.

Image credit: NASA / Chandra X-ray observatory.
Effects on the really small

10^{-10} meters

Atom

10^{-15} meters

Proton

Quarks

10^{-18} meters

Neutron

Atom

Quantum Field Fluctuations

1,000,000,000,000,000

000,000,000

Times/second (10^{-24}sec)

Empty Space is **NOT** Truly Empty

https://www.youtube.com/watch?v=J3xLuZNKhlY
Quantum Field Fluctuations

- **Multi-Dimensional Space (M-Space)** the LHC may find evidence of extra dimensions of space.
  - Space around us may be made of as many as 11 dimensions.
  - We experience only four dimensions (three of space and one of time) in everyday life and the other seven are so small that they become evident only on the subatomic scale.
  - If physicists notice a shortfall or a surplus of particles at the LHC, it might be the first evidence of M-Space.
- Mathematical models of the quantum chromodynamics (the strong nuclear force) suggests that the vacuum of space is filled with **Quark-Antiquark Pairs**.
  - A vacuum quark condensate (a sea of quark-antiquark pairs) is five times more dense than the matter at the center of a neutron star.
  - If we stretch the pairs they will form tiny strings. **String Theory** describes the resulting particle and seems to match some experimental results.
The scale of things
"It all fits together"

- Jeremiah 23:23-24

- "Am I a God who is near," declares the LORD, "And not a God far off? "Can a man hide himself in hiding places So I do not see him?" declares the LORD "Do I not fill the heavens and the earth?" declares the LORD.

Go To: http://htwins.net/scale/
What can it mean

- **Gravity and quantum theory caused the universe to be created spontaneously out of nothing!**
  - *Stephen Hawking* (Author and Physicist): “Before we understand science, it is natural to believe that God created the universe. But now science offers a more convincing explanation. In my opinion, there is no aspect of reality beyond the reach of the human mind.”

- **Where are we looking for God?**
  - *George Ellis* (British Astrophysicist): “Amazing fine tuning occurs in the laws that make this possible. Realization of the complexity of what is accomplished makes it very difficult not to use the word miraculous.”
  - *Arthur L. Schawlow* (Professor of Physics at Stanford University, 1981 Nobel Prize in physics): "It seems to me that when confronted with the marvels of life and the universe, one must ask why and not just how. The only possible answers are religious. . . . I find a need for God in the universe and in my own life."
God is everywhere

- What we thought was the emptiness of space is instead filled with God’s awesome creation.
  - Colossians 1:16 -- For by Him all things were created that are in heaven and that are on earth, visible and invisible...
- The scale of God’s creation is matched by the scale of God’s grace...
  - John 1:16 - For of His fullness we have all received, and grace upon grace.
- And that nothing is beyond God’s infinite forgiveness...
  - Psalm 103:12 - As far as the east is from the west, so far does he remove our transgressions from us.
- And that the unending grace that is given to us is all that we need...
  - 2 Corinthians 12:9 - My grace is sufficient for you.

**Material reality is not an obstacle to the revelation or knowledge of God, but is rather the very means and medium of that revelation - the space where the activity of God occurs.**