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# SPACE IS EXTREMELY EMPTY

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Abstract: For centuries just how empty space is has been pondered. It will be shown just how empty its volume is compared to the estimated volume of the mass therein.

Based upon the best guesswork of the astronomers at Cornell University, the current estimated mass in the universe including the current missing or dark matter is about $3 \times 10^{55}$ gms. This is within other previously estimated values without the dark matter that are about 10% of this.

Reduce this mass so that it occupies a spherical volume whose density is that of the proton or neutron. Performing the calculations then results in that its volume is about $2.1469 \times 10^{40}$ $cm^3$. The radius is about $173 \times 10^6$ km. This sphere would fit into the Earth's orbit ($149 \times 10^6$ km radius) about 16% further out towards Mars's orbit.

To put this in perspective, the volume of space based on its being 14 billion light years in radius then has a volume of about $9.7307 \times 10^{84}$ $cm^3$. Then the % of space occupied by the total mass is $2.23 \times 10^{-43}$ %.
(0.00000000000000000000000000000000000000000223 %)

To the best of the author's knowledge the emptiness of the hydrogen atom has been compared but not actually calculated. The volume of the hydrogen atom to the volume of the proton is about $6.35 \times 10^{14}$ times larger.

Space is indeed extremely empty.

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