

## Can You Count the Number of Stars and Planets?

Look up into the sky tonight and try to count the number of stars. How many do you think you can see? Scientists calculated that even with the best of visibility, you can only count a few thousand stars without the aid of a telescope.

With huge telescopes on Earth and satellite telescopes launched into orbit, astronomers have discovered there are also many distant galaxies in the sky, each containing billions of stars.

Do you want to take a guess as to how many stars exist?

One scientist conservatively estimates that our star, the sun, is one of over 100 billion stars in our own galaxy which we call the Milky Way. You can see a portion of the Milky Way in the sky at night. This is just one galaxy. Based upon observations using our telescopes, he calculates that there are 10 trillion galaxies in the universe. Multiplying that by the estimate of 100 billion stars in our typical galaxy, results in a very large number indeed: 100 octillion stars ( $10^{29}$ ), which can be written as the number 100,000,000,000,000,000,000,000,000,000.



*A view of a portion of the Milky Way toward the constellation Sagittarius (including the Galactic Center) as seen from an area not polluted by light (the Black Rock Desert, Nevada). The bright object on the right is Jupiter, just above Antares. By Steve Jurvetson (Flickr) CC permission BY 2.0 (<http://creativecommons.org/licenses/by/2.0>), via Wikimedia Commons.*

How many planets does our solar system contain? Astronomers have defined eight planets (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune).

There are many smaller planets out there, including Pluto—now called a “sub-planet.” Each of these planets plus Pluto have been photographed and studied by instruments on unmanned NASA satellites.

How many planets exist in the universe? Our powerful telescopes in space have viewed “exoplanets” (planets orbiting some distant stars). Many astronomers believe that every star system contains orbiting planets, just like our solar system.

Therefore, the number of existing planets may be eight times the already huge number of stars we calculated!

Some of those planets orbit in a “habitable zone” where water, hydrocarbons, temperature, gravity, sun light, and atmosphere can exist in proportions which sustain life, just like on Earth.

Are your children, grand-children, and their descendants destined to live on those inhabitable planets in the distant future? We have sent spacecraft (Voyager 1 and 2, Pioneer 10 and 11, and New Horizons) towards those twinkling star systems. Next we are planning to send people to occupy our neighboring planet Mars. Someday, it may be possible for us to inhabit even more distant planets.

Where else have humans been challenged to count the number of stars? In the book familiar to over 2 billion people today, namely the Bible book of Genesis: God took Abraham outside his tent and said, “Look up at the sky and count the stars—if indeed you can count them.” Then He said to him, “So shall your offspring be.”

It was around 4,000 years ago when God had this talk with Abraham. There were no big city lights interfering with the twinkling

stars in the moonless, clear sky that night. But Abraham still could have seen only a few thousand stars.



*The Vision of the Lord Directing Abraham to Count the Stars (woodcut by Julius Schnorr von Carolsfeld from the 1860 Bible in Pictures) Public Domain.*

So, how many descendants did Abraham have? Since he and his wife Sarah had not been able to conceive, both he and Sarah laughed when he was told this by God—he was 99 years old and his wife was about 90. Apparently, God had a sense of humor too, and was not angered by their reactions.

Therefore, when their baby was born they named it Isaac which means “laughing.” What a miracle this birth was! What joy! God fulfilled what He promised Abraham.

Well, it’s a long and complicated history, but Abraham’s descendants eventually wound up in Egypt due to a famine. Because they multiplied and became so numerous, one Egyptian ruler relegated them to his building programs and reduced them to cruel slavery.

God rescued them by sending Moses, a descendant of Abraham, to cast 10 plagues upon Egypt until finally, the Egyptian ruler released them.

The Jews numbered hundreds of thousands at the time of their Exodus from Egypt. Today, there are millions. Therefore, shouldn’t Abraham have seen millions and millions of stars instead of just a few thousand to account for the large number of his future descendants? Was God wrong?

Usually we reply to that question by explaining that God was just making an analogy—to infer that there would be a

“large number of descendants” and did not intend to give a specific number. That’s also how I understood these Bible verses.

When God asked Abraham to count the stars as the number of his future descendants, maybe He was also speaking to everyone in the future as well.

Was he actually saying that Abraham’s future descendants, and all humankind, would become billions of people and would someday be living in those star systems?

God never said in the Bible that He created *only* Earth to be inhabited. Who knows what wonders He has prepared out of His love for us humans?

So, God was not wrong about the number of stars and descendants. However, how will people reach those distant systems of stars and planets?

Continued work on Einstein’s General Relativity and spacetime shows that theoretically it is possible to space travel to other star systems within one lifetime. The 2014 movie, *Interstellar*, entertains and informs us about these possibilities. Its Theoretical Physicist, Kip Thorne, explains them in the feature segment: *The Science of Interstellar*. In addition, the world-famous physicist Stephen Hawking narrates a new PBS TV series *Genius* which explains some scientific space travel concepts for the general public, like us.

Sorry, but I still can’t count the number of stars and planets.



*The Hubble Space Telescope as seen from Space Shuttle Atlantis STS-125. (Public Domain)*

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Spacecraft going to the stars: [Voyager 1](#) and [Voyager 2](#) spacecraft, launched in 1977, entered [interstellar space](#) and are over 12 billion miles from Earth. They are headed to stars outside of our solar system and as Time Capsules carry pictures and sounds of Earth.

See: <http://voyager.jpl.nasa.gov/>      [https://en.wikipedia.org/wiki/Voyager\\_program](https://en.wikipedia.org/wiki/Voyager_program)

Other spacecraft traveling towards interstellar space: [Pioneer 10](#), [Pioneer 11](#), and [New Horizons](#).

Click > [pictures and sounds/music](#) of the planets they passed.

Planets Info: [Mercury](#) [Venus](#) [Earth](#) [Mars](#) [Jupiter](#) [Saturn](#) [Uranus](#) [Neptune](#) ([Pluto](#))

NASA: National Aeronautics and Space Administration Web site: [www.nasa.gov](http://www.nasa.gov)

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[Listen to actual sounds our satellites recorded](#) as they passed by planets and moons (now on YouTube)

[Hear "The Planets" – an orchestral suite](#) by Gustav Holst (now on YouTube)

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