# Our AMAZING Moon

The moon has drawn the attention of people for ages. It has been the subject of art, literature, poetry, and music. It has been a central feature in movies, television shows, and video games. It has been watched, studied, probed, and finally visited by people. It has been associated with romance. For many, the moon has been an object of wonder.

But just how amazing is the moon? What would life be like on Earth if there was no moon at all? What if the moon was smaller? What if it was bigger? What if it was closer or farther away? What if there was more than one moon? How would life on Earth be affected? Would it simply be a matter of changing the amount of light the moon provides at night? Or would there be something more?

**Ocean Tides**

Perhaps the most obvious effect the moon has on the Earth is seen in the ocean tides. The gravitational pull of the moon generates something called "tidal force".[1, 2] This force creates a "bulge" in the ocean water on the side of the Earth closest to the moon AND on the side of the Earth opposite the moon. As the moon orbits around the Earth and the Earth rotates, land masses moving through the bulge experience alternating high and low tides.

So, what effect do these tides have on life on Earth?

First, there is the effect on the plant and animal life in the intertidal zone (the area along the coast that is alternately covered by water or exposed to the air due to the changing tides). As the tide comes in, it brings with it the phytoplankton that serves as the first step in the oceanic/marine food chain. Included in this chain are clams, oysters, shrimp, crab, mussels, scallops, and abalone, all of which may be eaten by larger animals and/or people.

Tides also have an effect on life in estuaries, the areas where fresh water empties into the ocean. Estuaries provide areas for animals to nest and/or breed as well as a resting place for migrating birds and fish. Fish subject to sport and/or commercial fishing that spend at least part of their lives in estuaries include green sturgeon, chinook salmon, coho salmon, steelhead trout, California halibut, and starry flounder.[3] It has been suggested that an estuary provides a place for young chinook salmon to find food and go through the physical changes necessary for survival in the salt water of the ocean.[4]

While the size of tides is affected by more than just the moon (i.e. the gravitational pull of the sun, the relative positions of the sun, moon, and Earth in space, the shape of the coastline, and the shape of the ocean bottom)[5] the gravitational pull of the moon is the largest factor. It has been estimated that without the moon, ocean tides would be about 1/3 the size.[6, 7]

Any change in tidal range (difference between low and high tides) would undoubtedly affect the size of intertidal zones worldwide. A smaller tidal range would decrease the size of the intertidal zone. One effect of this would be to bring about a reduction in the plant and animal life that could be supported by the zone, including the foods (oyster, clam, salmon, etc.) available to humans. With a larger tidal range, a combination of a high tide accompanied by a storm or high winds could increase coastal flooding and erosion, potentially harming or reducing life in and near the tidal zone.[8]

**The Earth's Tilt**

Certainly not as obvious to us is the part the moon plays in the tilt of the Earth's axis, called axial tilt.

The axial tilt of the Earth is approximately 23.5[9] degrees as it relates to the Earth's orbit around the sun. While this axial tilt remains basically constant, the Earth's north pole changes in its orientation with regard to the sun as the Earth orbits around the sun, it either points more toward the sun or more away from the sun. The change in orientation affects the amount of daily sunlight received in each hemisphere. The changes in the amount of sunlight received in a hemisphere accounts for the changes of seasons.

But the axial tilt of the Earth has not always been the same and will not always be the same. As the Earth rotates, there is a slight change in Earth's axial tilt and a resulting wobble - a wobble none of us will notice during our lifetime. The tilt is suggested to change during a cycle lasting between 26,000[10] and 40,000[11] years with the tilt varying between 22.1 and 24.5[12] degrees.

If there had never been a moon or if there was more than one moon or a moon that was smaller or farther away, it is possible that the Earth's axis would, over time, have experienced a much larger change in tilt.

Uranus, for example, has an axial tilt of approximately 98[13] degrees. It is as if the planet is rolling as it orbits the sun instead of spinning as the Earth does. The tilt of Uranus has a profound impact on the length of a "day" and the season that is a result of the amount of daylight. For nearly one quarter of Uranus' orbital period (21 of 84 Earth years), one of Uranus' hemispheres experiences a 21-year day and the other hemisphere a 21-year night; one hemisphere gets 21 years of summer; the other 21 years of winter.

How did Uranus come to have such an extreme axial tilt? One theory is that the gravitational effect of a large moon caused its wobble to become so extreme[14] that the planet finally just "tipped over" as a spinning top does as its wobble becomes more extreme.

Our moon provides a gravitational pull that helps stabilize the Earth's tilt. For Earth, the axial tilt could certainly be affected by a smaller moon or a larger moon, a closer moon or a more distant moon, or by no moon at all. A larger tilt would mean hotter summers and colder winters. Could life on Earth tolerate more extreme seasons? Would life, as we know it, exist on Earth if the Earth's axial tilt was not stabilized by the gravitational pull of the moon?

**Other Possible Effects of the Moon's Gravitational Pull**

Other ways that the moon affects the Earth have been suggested. Here are two of them.

1 – The Magnetic Field

The Earth is surrounded by a magnetic field that protects life from the harmful effects of high-energy particles[15] produced by the sun. The magnetic field acts as a shield by redirecting these particles around the Earth. Without this shield, living organisms on Earth would suffer harm thought to include damage to DNA,[16] cancer, damage to the central nervous system,[17] and lethal radiation poisoning.[18] One can get some idea of the protection the magnetic field provides by considering that each day astronauts on the Mir space station have a radiation exposure equal to nearly eight chest X-rays.[19]

So what part does the moon play in the magnetic field? It has been suggested that the gravitational pull of the moon causes the movement of a semi-liquid layer of iron in the Earth's core. It is movement of this iron layer that generates the magnetic field.[20]

If there was no moon, would there be no magnetic field? If the moon was smaller or farther away, would there be a significant reduction in the strength of this magnetic field. If the moon was closer or bigger, what would the effect be?

2 – The Deep-Ocean Current, Phytoplankton, Our Atmosphere, and Climate

There is a global deep-water ocean current referred to as the Thermohaline Circulation. This slow-moving current moves cold ocean water from the polar regions to warmer areas. In the process, nutrients necessary for phytoplankton growth are brought up from deep water to the uppermost layer (sunlight zone) of the ocean[21] where phytoplankton growth can occur.

It has been generally thought that differences in water salinity and temperature has provided enough energy to drive the Thermohaline Circulation. However, there are other theories for the movement of the Thermohaline Circulation,[22] one of which involves the movement of tides.[23] If this theory is correct, then an alteration in tides due to a change in the gravitational pull of the moon (due to no moon, larger moon, smaller moon, closer moon, moon farther away, or multiple moons) could affect phytoplankton growth.

As noted earlier, phytoplankton play an important part in the oceanic/marine food chain. There are, however, two additional functions phytoplankton perform: they take in carbon dioxide and produced oxygen. A reduction in phytoplankton would mean an increase in carbon dioxide and a reduction of oxygen in the atmosphere. The increase of carbon dioxide in the atmosphere is generally thought to be a factor in global warming and climate change.[24] As for atmospheric oxygen, it has been estimated that ocean phytoplankton produce somewhere between 50% and 85% of the oxygen in our atmosphere.[25] How much oxygen could be lost from our atmosphere before animals and humans could no longer survive?

**Our Moon – A Perfect Companion**

It seems clear that the Earth would be a very different place if it were not for the moon that we have. What would life be like on Earth if there was no moon? if there was a bigger moon or a smaller moon? if there was a closer moon or a moon that was farther away? if there was more than one moon? Would there be any life on Earth at all?

It would seem that having the moon we have – its size and distance – has worked out pretty well for life on Earth. The gravitational pull of the moon makes for tides that work out pretty well for life on Earth. The tilt of the Earth is pretty constant and the Earth is not tipped over like Uranus. That makes for the seasons that, all-in-all, work out well for life on Earth. There is the magnetic field that protects us from harmful energy particles emitted by the sun. And there is the movement of nutrients needed for the growth of the phytoplankton that serve as a food source, take in carbon dioxide, and produce oxygen.

Was it just luck that the Earth ended up with a single moon that seems to be just the right size and at just the right distance from Earth? Or is the moon the creation of a designer who knew what we would need?

I would suggest there is just one logical answer: that there is a God that created the moon - a moon that plays the large part in our tides which, in turn, affects our plant and animal life; a moon that stabilizes the Earth's tilt which, in turn, is responsible for our seasons; a moon that may play a part in the creation of the magnetic field that protects us from harmful radiation produced by the sun; a moon that may have a part in the movement of nutrients necessary for the growth of the phytoplankton that serve as the first step in a complicated food chain as well as producing the oxygen we breath and consuming carbon dioxide that could be responsible for global warming and climate change. God created a moon that meets our needs.

But, in creating the moon, God did more than just meet our needs. The existence of the moon also points to His goodness. Think of the enjoyment people have playing in the snow or simply watching it fall. Think of the enjoyment people have in seeing the leaves of trees change color in the fall. Think of the enjoyment people have found in simply looking at the moon and/or studying it. Think of the enjoyment people have found in exploring tidal pools or surfing.

Due to His goodness, God gave us a moon that lights up the night, a moon that has inspired art, literature, poetry, and music, a moon that has sparked scientific curiosity, and a moon that adds to the romance shared by two people. God has shown His goodness by creating a moon that meets our needs and adds to our enjoyment of life.

The moon is amazing. It wasn't just luck and it didn't just happen. God did it!

If you would like to know more about why you can know there is a creator, visit www.AmazingByDesign.net. (.net NOT .com)

The God that created the moon wants to have a personal relationship with you. If you would like to know more about how you can have a personal relationship with the creator, visit www.AmazingByDesign.net. (.net NOT .com)

Endnotes:


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