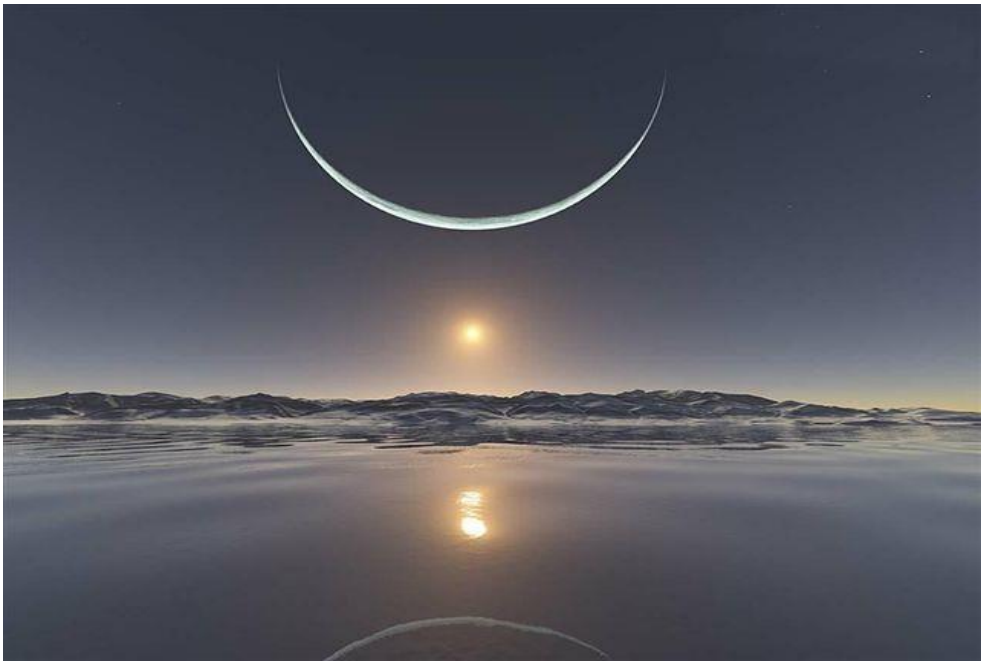
AL KITAB
The Renaissance Project

Chapter 7

Let There Be Light!



Mohamed Al Qadi

Sun and Moon

Perfection is a quality that remains elusive in nature. No human can ever be deemed perfect, not even the greatest of all men. The same however cannot be said of conditions, for they, though vary rarely so, can be absolutely perfect:

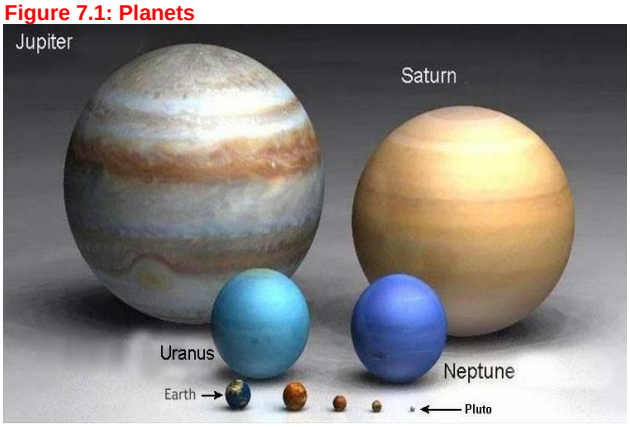
Our Solar System is less than 5 billion years old. It is home to Icy Planets, Gas Giants, Rocky Planets, Moons, Comets and Asteroids; all of which orbit around a Star known as the Sun. Despite their differences, these various worlds originated from a single source; a giant molecular cloud called the Solar Nebula(1).

When the Solar Nebula started to collapse to form our Sun (See Chapter 4), the outer edges of this Solar Nebula, called the planetary disks, began condensing and forming planets; Mercury, Venus, Earth, Mars, Jupiter, Saturn, Neptune, and Uranus. Yet it was Earth that would emerge among the bunch as a world possessing the perfect conditions necessary for life. These conditions that are so unlikely that one can't help but admire its master architect.

The Earth, unlike Mars for example, has the perfect mass to retain its atmosphere; a condition that makes life possible on the planet. It is situated at a perfect distance away from the Sun, not too close, and not too far to make the planet uninhabitable. Its moon, whose origin still baffles scientists to this day, is critical in simulating oceans and water currents . Studying our planet's history is fascinating. Everything seems to have gone "right" to make our world what it is today.

Of these numerous conditions, the Moon and Sun occupy central roles in the Earth's ability to sustain life. Both objects seem equal in size to the naked eye. Both light up our sky, though the latter does so with ferocious luminosity. Both objects are used to measure time and both have been worshiped by men of the ancient world for thousands of years. Yet underneath these commonalities are considerable differences. The Sun is massive, a star that binds the entire solar system to its orbit. The Moon on the other hand is 1/8th the size of Earth. It is a dull rocky object that orbits our Planet.

Figure 7.1: Planets



Did you know?

Jupiter is the biggest planet in our solar system. It is a Gas Giant that is two and a half times the mass of all the other planets in our Solar System combined! To this day, we are not entirely certain how planets such as Earth were able to form close to such a large neighbor.

Where did the Moon come from? – The Science

The most prominent theory describing the origins of the moon is the Giant Impact Hypothesis. In this scenario, a planet the size of Mars collided with Earth some 4.5 Billion Years ago. The collision between this planet and the newly formed Earth blasted material into Earth's orbit which accreted to form our Moon. Some scientists have gone further and hypothesized that the planet that collided with Earth is Mercury, which would explain some of Mercury's odd features.

In the following chapter, we will take a quick glance at the role of the Sun and Moon in providing Earth with light and compare this to Quranic verses. Let us start with the bigger and heavier of both bodies; our Sun.

Notes (1): The Nebular Hypothesis is the most prominent theory that attempts to explain the origin of our solar system

Sun and Moon

As we all know, without the Sun, life on Earth would be unsustainable. For example, its sunlight is critical in keeping the planet warm and enabling organisms such as plants to survive.

The Sun generates this light through nuclear reactions within its core (see Chapter 4) where it burns hydrogen and radiates energy as a result. The radiation is in the form of visible light (the light we see coming from the Sun) and invisible light (some of which is harmful like gamma rays). For thousands of years, it was presumed that the light coming from the Sun is directly responsible for "lighting up" our day. In fact many people still believe this. This is not entirely true. To demonstrate why, let us take another example in which Bob, our aspiring astronaut, intends to leave Earth.

It is a sunny day and Bob is scheduled to leave Earth on another space mission. He takes one last glimpse at his wife, wondering if he'll ever get to see her again before waving goodbye. As the rocket ascends, he looks out of his window and marvels at how beautiful the blue sky really is. The sunlight seems to grow stronger and stronger until the rocket finally leaves Earth's outer atmosphere. At this moment in time, Bob is shocked to see that he is suddenly surrounded by darkness. How can this be!? One would expect Bob, who is now much closer to the Sun, to be surrounded by light, not darkness. As he stares towards the Sun, Bob doesn't seem to recognize it. The Sun looks different. It is a bright white disk in the sky, similar to the other stars though bigger and more luminous (Figure 7.2)

Figure 7.2: The Sun

Figure 7.2 is a picture taken from outside the Earth's atmosphere. The Sun is a bright white disk surrounded by darkness.

The question we seek to answer is: how is our sky blue when the area just outside our atmosphere is black? The answer is the varying factor; Earth's atmosphere. Our atmosphere is not only responsible for protecting us against harmful sunrays (See Chapter 8), it is also responsible for making our sky blue. Without an atmosphere, the sky would appear black at all times.

The scientific reason behind this is called "Rayleigh Scattering of Light". Our atmosphere is composed of particles that scatter light coming from our Sun. It scatters light of shorter wavelengths more than other wavelengths. Since blue has the shortest wavelength of visible light (see Chapter 2), it is scattered the most by our atmosphere, making the Earth's sunlit sky appear blue and our Sun appear yellow / red. Thus, though our Sun is responsible for providing us with light, our atmosphere is what makes our daily sky appear in its current form; blue not black.

During nightfall, the Moon is a primary source of light. However, the Moon's ability to emit light is very different from our Sun. Unlike the Sun, the Moon is not a star. It does not emit energy and light from nuclear reactions. In fact, the Moon doesn't "produce" light of its own and is actually dark.

The way the Moon provides us with light is through reflection. The Moon's surface reflects sunlight to observers on Earth making it appear like the Moon is the source of it. The light coming from the moon is actually light primarily coming from the Sun.

Sun and Moon

There are many verses that describe the Moon and the Sun in the Quran, many of which mention their light emitting nature. What is interesting is that the Quran makes a distinction between moonlight and sunlight:

"وَجَعَلَ الْقَمَرَ فِيهِنَّ نُورًا وَجَعَلَ الشَّمْسَ سِرَاجًا" (71,16)
"And placed the Moon therein for a light, and made the Sun a lamp"

"وَجَعَلْنَا سِرَاجًا وَهَّاجًا" (78,13)
Of the Sun - "And created a (flaming / hot/ radiant) lamp"

Of the various verses that describe the Sun, the majority have described it as "Siraj" (lamp), in some cases, "Siraj Wahaj" (flaming, hot, radiant lamp). This is because like a lamp, the Sun is a source of light that burns fuel to generate energy. It is an accurate analogy, particularly the second verse, which not only describes it as a lamp, but as a flaming, radiant hot one.

Furthermore, the Quran only describes the Moon as a light in all of its verses. It never describes it as a lamp or a light generator. This fits well with our understanding of the Moon and Sun; the Sun being a burning source of fuel which radiates light while the Moon only reflects it.

But the most interesting description of the Sun can be found in Chapter 91 "The Sun". As discussed previously, though the Sun is the source of light, our atmosphere is responsible for creating the conditions of day. It is responsible for making our sky appear blue and our Sun to appear yellow. Outside it, as Bob found out, the Sun is surrounded by darkness. In Arabic, the outer reaches of our atmosphere, what appears like a thin layer dividing space darkness and light here on Earth, (Figure 7.3) is called "طبقة النهار" – the layer of day. This is because past this boundary, the appearance of daylight that is familiar to us no longer exists.

Figure 7.3: The Atmosphere's Boundary

Figure 7.2 shows "the layer of day" (light blue shell surrounding Earth)

"وَالنَّهَارِ إِذَا جَلَّاهَا وَاللَّيْلِ إِذَا يَغْشَاهَا" (91,3-4)
"And the Day which elucidates / clarifies it (Sun), and by the Night that envelops it (Sun)"

The verses above could elude to this. Allah points out that it is the Day that gives the Sun its appearance to observers here on Earth, making it appear in its current form. The second verse goes further to suggest that the Sun is engulfed by darkness.

With the end of this chapter, The First Part (Part One) of Al Kitab's "Volume 1" comes to a close. We have seen how the Quran describes the Universe in the most accurate of manners. In Part Two, we will examine earthly matters from a scientific and Quranic perspective and analyse whether the symmetries between both fields will continue to hold.

Primary Sources

- Mark Garlick. The Story of the Solar System (Cambridge University Press, 2002)
- Douglas Palmer. Earth in 100 groundbreaking discoveries
- Dr Zaghlul Najar. Al Sama'a in the Quran (2010)
- Dr Zaghlul Najar: Mokhtarat Min Tafseer Ayat Al Kawniya Fi Al Quran Al Kareem (2010)
- Cesare Emilliani. Cosmology, Geology, and the Evolution of Life and Environment
- Majid Fakhry. The Quran, A Modern English Version
- Roohi Baalbaki, Al-Mawrid (Dar El-ILM LiLMALAYEEN, 1988)
- The Holy Quran
- Ibn Katheer. Tafseer Al Quran (1344)
- Mohamed Pickthall. The Meaning of the Glorious Quran

Photo and Figure Sources

- Figure 7.1 Photo Credit: Winona Campbell
- Figure 7.2 and 7.3 Photo Credit: NASA