

Qur'anic Verses and Selected Scientific Concepts: A Comparative Interpretive Study

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ABSTRACT

The relationship between the Qur'ān and modern science has long attracted scholarly attention. Scientific exegesis has emerged by interpreting Qur'ānic verses alongside empirical findings in fields like cosmology, embryology, oceanography, geology, atmospheric science, and biology. Yet, most studies emphasize these parallels as evidence that the Qur'ān confirms specific scientific principles, often overlooking the historical context of the verses, the interpretive approaches of both classical and modern exegetes, and their understanding of the texts. Moreover, there has been limited theoretical exploration regarding the nature of these correspondences. This study seeks to fill this gap by analyzing selected Qur'ānic verses through both classical and modern tafsir in relation to contemporary scientific knowledge. It also investigates the limitations of drawing connections between Qur'ānic interpretation and scientific understanding. Employing a qualitative, comparative, and interpretive methodology, the study focuses on how the interpretation of selected verses has evolved from classical to modern exegesis. The findings indicate that many perceived correspondences are largely the result of modern exegetical perspectives rather than meanings firmly rooted in earlier traditions. Thus, these connections are more accurately described as "exegetical alignments" than as anticipations of modern scientific discoveries. Ultimately, the study offers a comparative and interpretive analysis of selected Qur'ānic verses and underscores the importance of methodological rigor and interpretive caution when exploring the relationship between the Qur'ān and contemporary scientific knowledge.

Keywords: Qur'anic Interpretation, Religion and Science, Islamic Epistemology, Scientific Interpretation of Scripture, Interdisciplinary Studies.

1. INTRODUCTION

The relation between religious texts and science has been a topic of discussion for scholars throughout the centuries, and religious texts have been a central part of this discourse. For a long time, there have been scholars who have interpreted the Qur'an as describing phenomena in the natural world that would only be confirmed by modern science in later years (Bucaille, 1976). The fact that some verses talk about natural phenomena in ways that seem to have been beyond the scope of the seventh century. This is part of a broader discussion. The tradition of "i'jaz 'ilmi" (scientific miraculousness) from Bucaille (1976) and Moore and Al-Zindani (1992), holds that the verses of the Qur'an match up exactly to modern scientific discoveries. This view is not shared by all Islamic scholars, with Sardar (1989) cautioning that theories of the modern period should not be imposed on an older text, and Guessoum (2011) expressing a similar concern in respect to reading back from the text instead of careful exegesis. There is also a philosophical issue as to

whether scripture and empirical science can be commensurable or not (Barbour, 2000; McGrath, 2004). The different approaches are not clearly covered in much of the scholarship that deals with the Qur'an–science correspondence. Some studies focus on the compatibility of the Qur'an with modern science, while ignoring methodological criticisms against the concordist interpretations. Thus, it is difficult to see how one can distinguish between an authentic and an anachronistic comparative interpretation.

The aims of the study are twofold: (1) the examination of the interpretation of selected verses from the Qur'an in classic and contemporary exegetical works as well as the interpretation of them within the tradition of concordism; (2) the establishment of the interpretive boundaries, historical, linguistic, and epistemological, within which any conjecture of “correspondence” between the verses of the Qur'an and discoveries in the field of scientific fact must respect. The study is comparative-interpretative in nature, that is, it is one which seeks to look for parallels of scriptural interpretation and scientific method as two distinct modes of enquiry but avoids the anachronistic fallacy of reading later theories into a historical text (Sardar, 1989; McGrath).

2. METHODOLOGY

The research approach in this study is a qualitative comparative-interpretive design by integrating textual analysis and focused review of exegetical and scientific literature. Some selected verses from the Qur'an about natural phenomena were studied in Arabic with reference to classical and modern tafsir. The verses were selected on purpose, taking into consideration their connection to scientific topics covered by the study, such as cosmology, embryology, oceanography, geology, atmospheric phenomena, and biology. The analysis is based on the text and their exegesis interpretations and the evaluation of the interpreted verses in comparison with the concepts found in the literature of the present time. The state of knowledge with regard to these phenomena was evaluated based on peer-reviewed scientific sources. The comparison is between the meaning of the Qur'an in its literal sense, in its exegesis, and in science. Thus, similarities are considered to be the "interpretive and conceptual correspondences" and not scientific forecasts or tests of Qur'anic statements. This method acknowledges the various linguistic, historical and epistemological contexts of the interpretation of the Qur'an and the scientific method.

3. Cosmological Insights

3.1 The Expanding Universe

In the Qur'ān, one of the most common phenomena with modern cosmology is that of the expansion of the universe. The verse from the Qur'an (51:47) is frequently translated as, "We have created the universe with great force and firmly established it, indeed We are certainly expanding it. Modern commentators have interpreted the Arabic *mūsi'un* to mean the continuous or unlimited expansion (Al-Ghazali 2011). It should be noted, however, that classical exegeses like Al-Tabari (d. 923 CE) interpreted this verse neither in a cosmological sense but rather as a statement of God's power and ability; the reading of the verse in astronomical terms is a comparatively recent interpretive development in tafsir (Nasr, 2006).

The change from a theological interpretation of the verse to a cosmological interpretation of physical expansion is noteworthy, since it is an approach of modern interpretation, not necessarily one that was clearly used or understood by the earlier readers.

This modern interpretation has been promoted as being in harmony with the twentieth century scientific discovery of the expansion of the cosmos. Einstein's General Theory of Relativity (1916) suggested that the universe should shrink or grow, but his reluctance to a changing model led him to add a cosmological constant, which he later called his biggest blunder. This was confirmed by Edwin Hubble's observation in 1929 that galaxies move away from each other at a rate proportional to their distance, and confirmed by redshift measurements (Weinberg, 2008), the value of which

is estimated today to be roughly 70 km/s/Mpc (Riess et al., 2019). This body of evidence supports the Big Bang cosmology.

The modern concordist refers to the Qur'anic term مُوسِعُونَ (mūsi'ūn) that would be consistent with this scientific understanding of a continuously expanding cosmos, and some go further in their extension to the discovery of the rate of expansion accelerating, based on observations of distant supernovae, that is attributed to dark energy. It should be remembered that this is an interpretive correspondence, not a scientific statement: the verse does not provide a quantifiable description of the rate of expansion, the mechanism or the acceleration; and the correspondence is made by reading a general statement about God's ability through a particular modern scientific discovery. It is important to note that the example given here is not meant to be taken as proof that the Qur'an foretold twentieth-century cosmology, but rather as an illustration of the concordist interpretive tradition and its method.

3.2 Celestial Orbits and Gravitational Stability

The Quran describes celestial mechanics with remarkable precision. The Qur'an (21:33) says: "It is He who created the night and the day and the sun and the moon: all the heavenly bodies are in their orbit, swimming. The Arabic verb yasbaḥūn means "to swim smoothly, steadily, and to oneself. The verse is a statement of observation: That celestial bodies move in a continuous manner.

Modern astrophysics, in contrast, interprets such motion in terms of gravitationally controlled dynamics: celestial objects move around according to the laws of Kepler and Newton's law of universal gravitation (Murray & Dermott, 1999), and over the long-term, their orbits are stable due to the orbital resonance phenomena and tidal forces (Laskar, 2008). As you read through this scientific picture, the passage's portrayal of continuous, organized motion in the heavenly bodies can be interpreted as using an analogical way of speaking to describe gravitationally driven orbital motion, not as a scientific prediction or description of the gravity-based mechanism. The overall concept of motion and order is conveyed by the Qur'anic text, and any careful observer of the sky could see that the sky is curved and moves in an elliptical path, it resonates, it is pulled down by gravitational forces; but that is a separate scientific discovery, and it is not written into the text.

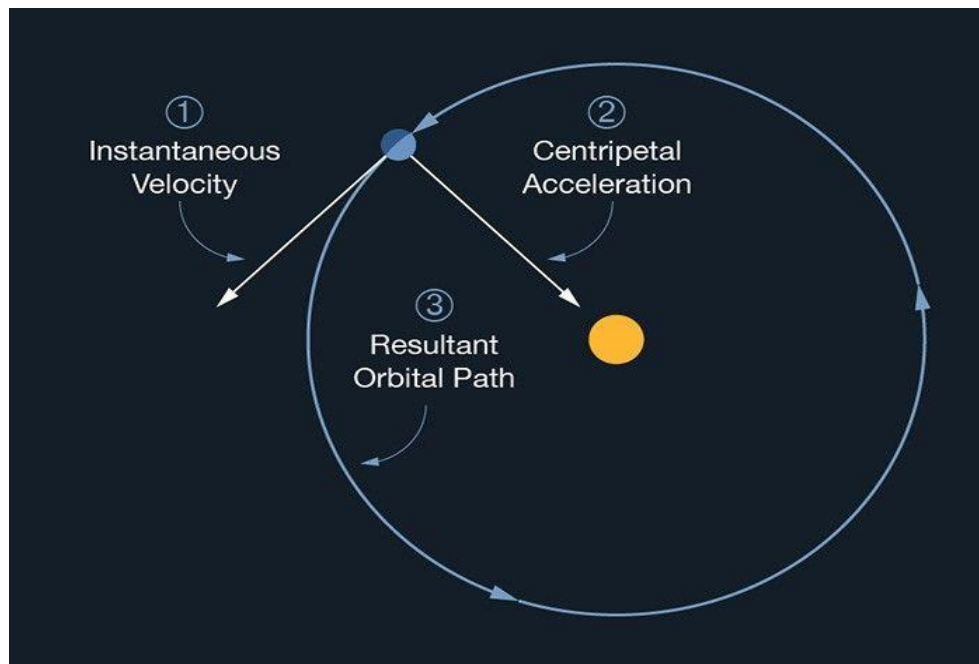


Figure 1. Motion in a circular orbit under a central gravitational force (adapted from Serway & Jewett, 2018)

3.3 Gravity and Earth in the Quran

Some commentators have interpreted certain verses of the Qur'an, which refer to the earth, the atmosphere and celestial motions, to accord with the modern physical understanding that these motions are caused by gravity, as referred by Bucaille (1976) and Naik (2000). The verses "And it is HE who created the heavens and earth in truth. And the day He says, 'Be,' and it is, His word is the truth" (Quran 6:73), "And We have made from water every living thing" (Quran 21:30) and "And it is Allah who sends down rain from the sky, and We give life thereby to the earth after its lifelessness" (Quran 2:164) all say in general terms that earth, water, and living things are ordered to be created by Allah and receive sustenance from Him; on their own, they do not refer to any specific physical mechanism, e.g. attraction of the earth to the water, or water to the earth, or of water to the living things, or of the living things to the water. Some commentators have, however, embedded the texts in the context of gravitational support of atmospheric pressure and liquid water (Al-Zindani, 1995), which is in harmony with their general affirmation of divinely maintained order, although not an explicit description of this particular physical mechanism.

This is also found in the Quranic verses "And Allah has made for you the earth an expanse that you might go about therein on spacious roads" (71:20), and "Have We not made the earth a container for the living and the dead?" (Quran 77:25–26). In these verses the earth is described as being fit for human habitation and support, and there is a modern scientific explanation for this, which some readers, like Moore and Al-Zindani (1992) and Yahya (2002), have linked to this general description: because the mass of the earth provides enough gravitational force to keep the atmosphere in place.

The verse, "It is HE who created the night and the day and the sun and the moon; all of these are in an orbit" (Quran 21:33), is also read in the same manner by some such as Bucaille (1976) as being consistent with the concept of orbital motion which is governed by gravitation as described in general relativity, in which massive bodies cause a curving of spacetime that leads to the orbital motion of celestial bodies. Once more, like in the parallel discussion in Section 3.2, the verse does not tell us how the motion is sustained, it merely describes it as sustained, and the gravitational and relativistic explanation is a scientific development that comes after the verse; some readers bring the gravitational and relativistic explanation to the verse by a different kind of interpretative analogy.

These readings have been claimed by some authors to demonstrate that the passages written long before the publication of Newton's *Principia Mathematica* (1687) and Einstein's general theory of relativity (1915) predict a number of later discoveries concerning the nature of gravitational phenomena, the retention of elements in the atmosphere, the mechanics of orbits, and the nature of geological processes (Bucaille, 1976; Moore & Al-Zindani, 1992; Yahya, 2002). This study doesn't make that more forceful statement. It should be understood that the correspondence is no evidence that this gravitational theory was expected in the text, but rather the result of a modern interpretation.

A similar reading has to do with the Quranic verse, "Aye, and We set in the earth set mountains firmly, lest it should shake with them" (Quran 21:31), which has been related to the Earth's isostatic equilibrium concept, which states that mountain roots that penetrate the Earth's crust help stabilize it (Naik, 2000). As above, the verse teaches about the stability of mountains, but does not provide the geophysical mechanism of isostasy, a modern scientific model which this study treats as an interpretive parallel, not a description of a mechanism provided by the verse.

3.4 Absence of Visible Pillars

The Quran says, "Allah is He who raised the sky with no visible pillars. (Quran 13:2) As a text observation, the verse says that there are no visible supporting structures for the heavens and does not say what, if anything, does support the heavens.

Some readers read the verse in the light of modern science of gravity and the large-scale structure of the universe, in which case the pillars are not visible. Einstein (1916) described gravity in terms of curvature of space-time, without any "support. Likewise, dark matter, believed to make up 85% of all matter in the universe, is known to play a role in the gravitational organization of the universe.

This reading interprets the verse that "no pillars can be seen", not only as acceptable but as a support to the modern theory of structuring of gravitational and dark-matter that is invisible to us. The verse in itself does not mention the curvature of space-time, general relativity, or dark matter, and numerous interpretations that do not ontologize such notions are still available that are based on a general theological affirmation of divine power. Like the previous examples, the same verse is here to illustrate how it was interpreted in modern times, not as a prediction of twentieth century modern cosmological physics.

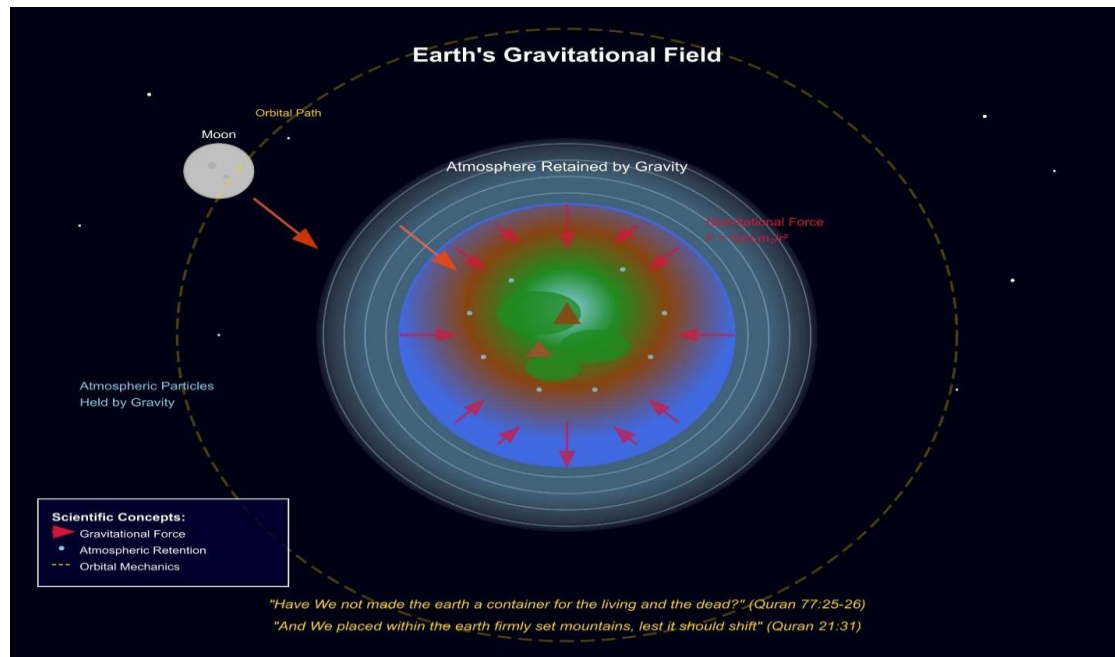


Figure 2: Earth's gravitational field and mass distribution (adapted from Carroll & Ostlie, 2017).

4. Atmospheric and Environmental Sciences

4.1 Protective Atmosphere

The Quran describes the sky as a protective covering: "And We made the sky a protected ceiling, but they, from its signs, are turning away" (Quran 21:32). Such metaphor of protecting the atmosphere is extremely compatible with the contemporary knowledge about the role of the atmosphere in protecting the Earth (Wallace and Hobbs, 2006).

The atmosphere of the earth performs several protective shields: the ozone layer absorbs the damaging ultraviolet radiation (Solomon, 1999). The magnetosphere removes the cosmic radiation and particles of the solar wind (Kivelson and Russell, 1995), and the density of the atmosphere cushions the meteorite impacts by frictional heating of the atmosphere (Ceplecha et al., 1998). The earth would not be habitable without this shielded sheet since it would be subjected to radiation and bombardment by meteorites.

4.2 Light of the Sun and Moon

Quran differentiates between various forms of heavenly illumination: "He is the One Who made the sun a radiant source and the moon a reflected light, with precisely ordained phases, so that you may know the number of years and calculation of time". Allah did not create all this except for a purpose. He makes the signs clear for people of knowledge (Quran 10:5). The Arabic words siraya-

kan (burning lamp) to mean the sun, and nur (lit-up) to mean the moon implicate alternative forms of illumination (Ibn Kathir, 1365/1946).

This is the exact difference between modern astronomy: the sun produces light by means of nuclear fusion, which transforms hydrogen into helium and causes emission of electromagnetic radiation (Clayton, 1984), and the moon refracts the rays of the sun with its albedo of about 0.12 (Hapke et al., 1996). Early civilizations generally regarded the two as glowing bodies, so this Quranic distinction is scientifically prophetic.

5. Oceanographic Sciences

5.1 Physical Barriers Between Seas

The barrier between various water bodies is highly vivid oceanographic description in the Quran: "And it is HE who has released [simultaneously] the two seas, one fresh and palatable and one salty and bitter, and He placed between them a barrier and prohibiting partition" (Quran 25:53).

In contemporary oceanography, a number of phenomena that form boundaries between water masses have been determined. Haloclines are sudden changes in the salinity between the layers of water, which cannot be mixed vertically (Pickard and Emery, 1990). Out of the interfaces between rivers and oceans, the differences between densities form observable boundaries, with fresh and saltwater retaining distinguishing properties over a significant distance (Geyer and MacCready, 2014).

A good example is the Mediterranean-Atlantic interface at the Strait of Gibraltar where Mediterranean water retains unique temperature and salinity features, as it circulates under the Atlantic water (Bryden and Stommel, 1984). On the same note, the Baltic Sea-North Sea interface forms a standing halocline with a depth of about 60-80 meters (Matthaeus and Franck, 1992).



Figure 3: Satellite imagery of the Strait of Gibraltar showing the visible interface between Mediterranean and Atlantic water masses, distinguished by differences in temperature and salinity (NASA Earth Observatory, n.d.).

5.2 Darkness in the Depths of the Ocean

The Quran provides a remarkably accurate description of deep ocean conditions: "Or [they are] like darknesses within an unfathomable sea which is covered by waves, upon which are waves, over which are clouds - darknesses, some of them upon others" (Quran 24:40).

This verse describes multiple layers of darkness in deep ocean environments, corresponding to the physics of light attenuation in seawater. The photic zone extends only to approximately 200 meters depth, beyond which sunlight cannot penetrate effectively (Kirk, 2011). Different wavelengths of light are attenuated at different rates in seawater: longer wavelengths such as red

are absorbed rapidly in the upper water column, while shorter wavelengths such as blue penetrate to greater depths, particularly in clear ocean waters (Jerlov, 1976). The description of "waves upon waves" accurately describes internal waves that occur at density boundaries within the ocean, invisible from the surface but detectable through modern oceanographic instruments (Garrett & Munk, 1979). These internal waves can have amplitudes exceeding 100 meters and represent significant energy transport mechanisms in ocean circulation (Wunsch & Ferrari, 2004).

5.3 Marine Resources

Quran underlines the importance of the ocean in terms of being a source of sustenance: And it is He who subjected the sea for you to eat from it tender meat and to extract from it ornaments which you wear. And you see the ships plowing through it, and [He subjected it] that you may seek of His bounty; and perhaps you will be grateful. (Quran 16:14).

In this verse, there is the recognition of marine resources that incorporate nutritional and decorative resources in the future because there is our knowledge of marine biodiversity and ecosystem services (Costanza et al., 1997).

Contemporary marine biology validates that oceans can supply nearly 16 per cent of animal protein consumption all over the planet, and marine fisheries have a population of more than 200 million worldwide (FAO, 2020). There are also marine environments that produce pearls, corals and other ornamental products as is mentioned in the verse that talks about ornaments (Southgate & Lucas, 2008).

5.4 The Water Cycle in the Quran

The Quran has various references to water and its different functions that do coincide incredibly with the scientific knowledge of the water cycle. These verses talk about the rain, evaporation, ground water and how water is constantly moving between the earth and the sky showing advanced understanding of the hydrological process (Bucaille, 1976).

Evaporation and Cloud Formation

The Quran explains how clouds are formed and the evaporation of water:

"And it is he who rains down in the heavens, and we grow there the vegetation of all kinds, we grow therein a greenery, whence we grow grains in layers (Quran 6:99).

" And it is Allah who also sends the winds and they cause the clouds and swirl them in the sky as Allah wills and makes them rags so that you can see the rain coming out of them" (Quran 30:48).

These verses explain clearly how evaporation takes place resulting to cloud formation and ultimate precipitation (Yahya, 2002).

Precipitation and Distribution

The Quran emphasizes the controlled distribution of rainfall:

"And We have distributed it among them that they might be reminded, but most of the people refuse except disbelief" (Quran 25:50).

"And it is HE who sends down rain from the sky, and We produce thereby the vegetation of every kind" (Quran 6:99).

These verses emphasize the systematic water allocation in various parts and it is central to the water cycle (Al-Zindani, 1995).

Groundwater and Springs

The Quran also references groundwater systems:

"And We sent down from the sky water in due measure, and We settled it in the earth. And indeed, We are Able to take it away" (Quran 23:18).

"Have you not seen that Allah sends down rain from the sky and makes it flow as springs [and rivers] in the earth?" (Quran 39:21).

These verses explain how water enters the earth and how it comes out of it in the form of springs ground (Bucaille, 1976).

Continuous Circulation

The concept of continuous water circulation is evident:

"And We send the winds fertilizing, and We send down water from the sky and give you drink from it, and you are not its storekeepers" (Quran 15:22).

This verse reiterates the cyclic nature of the water cycle and, how humanity is dependent upon this natural process.

These Quranic descriptions are accurate as validated by modern hydrology. The water cycle involves:

- a. Evaporation: Solar power leads to the evaporation of water in oceans, rivers and lakes.
- b. Condensation: The water vapours create clouds in the atmosphere.
- c. Precipitation: Water is deposited back to earth in form of rain or snow among others.
- d. **Collection:** Water either passes into rivers or infiltrates into the ground water or flows back into the water bodies.

These mechanisms are consistent with the descriptions in the Quran that were written 1,400 years ago when there was no modern science about weather patterns and hydrology (Yahya, 2002). The accuracy of the quranic references of natural phenomena has been observed by islamic scholars and scientists. Professor Keith Moore, an embryologist, observed how different scientific references had been precise in the Quran and also the references touched upon natural phenomena such as the water cycle (Moore and Al-Zindani, 1992).

6. Biological and Forensic Sciences

6.1 Origin of Life from Water

The Quranic assertion that all life originates from water represents a fundamental biological principle: "And We made from water every living thing" (Quran 21:30).

This is consistent with the modern knowledge of the water origin of life and the necessity of water in the biological processes (Miller and Lazcano, 1995).

According to the research on abiogenesis, life origin 3.5-4 billion years ago was in the form of water which was the universal solvent in biochemical reactions (Orgel, 1998). It is a requirement of all known forms of life to have water to carry out metabolism, upkeep of cell structures, and transferring their genetic information (Ball, 2008). Human body contains about 60 percent of water, and some creatures such as jellyfish have more than 95 percent water content (Milo and Phillips, 2015).

6.2 Fingerprints and Individual Identity

The Qur'an refers to fingertips specifically in regard to human resurrection: "Yes, [We are] Able [even] to proportion his fingertips" (Quran 75:4). As a text, its assertion is that God has the power to accurately rebuild even the minutest part of the human body and a fingertip is cited as an example of God's accuracy; the verse does not say anything about the individuality of fingerprints or the uniqueness of the ridge patterns. Others have made links, however, with the modern forensic knowledge of the uniqueness of the ridges on the tips of each finger (Galton, 1892).

The modern forensic biology now has confirmed that ridge patterns of fingerprint develop in the foetal stage and stay fixed throughout a human's life and each person has a unique pattern

(Champod et al., 2016). The chances of two people having a matching fingerprint have been calculated at 1 in 64 billion (Pankanti et al., 2002). Ridge-pattern formation is a complex process influenced by environmental factors in the womb as well as by genetic factors in vascular, skeletal and mechanical development (Kücken & Newell, 2005) and the permanent ridge is formed at the junction of the epidermis and dermis, being the foundation of fingerprint identification (Okajima, 1975).

When combined with this scientific picture, that God can restore even the fingertips, the verse's focus on the individuality of the fingerprint should not be interpreted as a specific prediction, but rather as a point of contact in interpretation with the modern discovery of fingerprint individuality. Theological issues are raised by the verse itself, namely the divine power in bodily restoration in resurrection, and the fingertip is only used within the verse as an example of fine detail, rather than as a reference to fingerprints in the forensic sense as modern science has come to define. The connection here is best understood as a modern, interpretive, reading of a general statement of divine precision which is then correlated with a specific empirical finding that was only discovered many centuries later.



Figure 4: Ridge patterns and minutiae in human fingerprints (adapted from Champod, Lennard, Margot & Stoilovic, 2016)

7. Geological Sciences

7.1 Mountain Formation and Stability

The Quran describes mountains as "pegs" or stabilizers: "Have We not made the earth a resting place? And the mountains as stakes?" (Quran 78:6-7). The Arabic *awtada* implies profound bases, which are equivalent to the current concept of isostatic balance and mountain roots that stretch deep within the crust of the earth (Press & Siever, 2001).

Geological studies have validated that mountain ranges have their deep roots on the crust that balances the gravitational processes in the form of isostatic adjustment (Turcotte and Schubert, 2002). The mountainous range Himalayan range crusts are elaborate, as an example, having crustal roots that are deep (70-80 kilometers) and regular crustal thickness of continents is 35-40 kilometers (Nelson et al., 1996). These are strong roots, which give the mountains stability and do not allow them to be floating in the ground mantle.

7.2 Earth's Shape

The Quran, without explicitly describing the Earth as spherical, conveys its rounded nature through verses that depict the alteration of day and night and various geographical phenomena. The verse "HE created the heavens and earth in truth. He wraps the night over the day and wraps the day

over the night" (Quran 39:5) uses the arabic verb "yukawwir," meaning "to wind around" or "to coil," suggesting a spherical surface where day and night wrap around continuously (Al-Tabari, 923/1999).

The given description is consistent with our ideas about the rotation of the earth and the day-night cycle caused by the solar sources of light on a sphere planet (Seidelmann et al., 2007).

8. Embryological Descriptions

The Quran gives in-depth descriptions of human embryological development that has drawn numerous scientific interests. The key passage states:

"And certainly did We create man from an extract of clay. Then We placed him as a sperm-drop in a firm lodging. Then We made the sperm-drop into a clinging clot, and We made the clot into a lump [of flesh], and We made [from] the lump, bones, and We covered the bones with flesh; then We developed him into another creation. So blessed is Allah, the best of creators" (Quran 23:12-14).



Figure 5: Stages of human embryonic development (adapted from Sadler, 2018).

These descriptions were examined in connection with the contemporary embryological knowledge by embryologist Keith Moore, working with islamic scholars (Moore and al-Azzindani, 1983). The Arabic words are surprisingly similar to known stages:

- **Nutfah (sperm-drop):** Refers to the zygote and initial stages of cleavage (0-2 weeks)
- **Alaqah (clinging clot):** The appearance of the implanted blastocyst and the embryo at (2-3)-weeks.
- **Mudghah (lump of flesh):** The embryo at the period of somites formation (3-4 weeks)
- **Bone and flesh formation:** Characterizes the process of organogenesis and tissue differentiation (4-8 weeks)

The same sequence of development has been verified by modern embryology, where the formation of the bones occurs before the development of the muscle in most structures of the body (Sadler, 2018).

9. The Tailbone and Resurrection:

Islamic theology presents a unique perspective on human resurrection through the concept of “‘ajb al-dhanab” (عجب الذنب), the tailbone or coccyx. This small bone serves as the indestructible foundation from which Allah will recreate human on the day of resurrection, as referenced in the Quranic promise: "Does man think that We cannot assemble his bones? Yes, We are able to put together in perfect order the very tips of his fingers" (Al-Quran, 75:3-4).

Precise descriptions of the tailbone as having specific unique properties were specifically described by the Prophet Muhammad (peace be upon him) in authentic hadith. Abu Huraira said: Every element of the human body will wither except the coccyx bone and out of that bone Allah will rebuild the entire body (Bukhari, 4935). This lesson confirms that the decomposition of all human tissues takes place after death but the tailbone is not lost because it is the seed of resurrection.

Scientifically, the coccyx is a very interesting structure which has special developmental implications. Tailbone is composed of three or five united vertebrae that form the end of the vertebral column (Moore et al., 2019). During early embryonic development, the primitive streak functions as a key organizing structure that helps establish the body axis and guides cellular differentiation and tissue formation (Gilbert, 2020).

The coccyx is made of dense bone tissue of distinctive mineral composition which is not similar to that of other bones. It has a smaller size and smaller blood flow, which predetermines a less favourable environment of bacterial batters in its context than in other skeletal elements (White and Folkens, 2021). Archaeological findings show that the presence of coccygeal bones in other skeletal remains is frequently better preserved in a range of soil conditions, and thus, structurally stable over long durations (Haglund and Sorg, 2018).

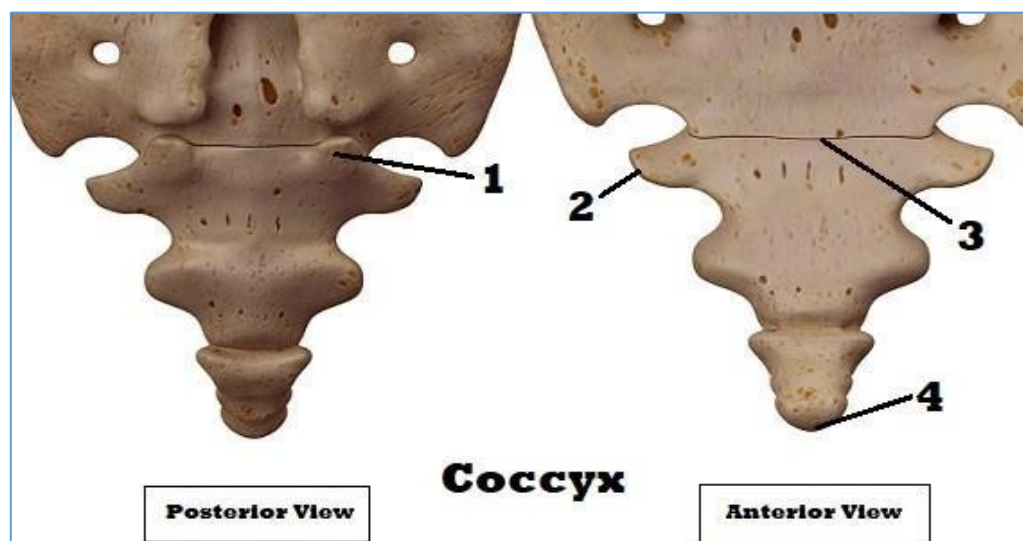


Figure 6: Posterior and anterior views of the coccyx (adapted from White & Folkens, 2021)

As modern molecular biology indicates, DNA is present in osteocytes and bone matrix of bones, and the dense structure of the coccyx may offer better protection to the genetic material (Adler et al., 2020). Although the DNA decomposes to a certain extent after one dies, some conditions in the environment can cause remarkable times of time to keep genetic information stored in bone tissue. Nevertheless, the islamic doctrine goes beyond nature conservation since divine intervention is given more importance as compared to natural processes.

There is also the scientific interest of the presence of cellular memory and epigenetic information in the bone tissue. Bone cells do not only have structural proteins but also regulatory molecules that hold biological information of the personal peculiarities (Zhang et al., 2019).

10. Gender Determination

The Quran attributes gender determination to the male contribution: "And that HE creates the two mates - the male and female - from a sperm-drop when it is emitted" (Quran 53:45-46). " This is in accordance with recent genetic research that males are heterogametic (XY), and females homogametic (XX) by their chromosomes, which have the Y chromosome and the X chromosomes respectively (Gilbert, 2013).

Quranic References and Modern Scientific Discoveries - Summary Table

Table 1: Correlations Between Quranic Verses and Scientific Discoveries

Scientific Domain	Quranic Reference	Verse Translation	Modern Scientific Discovery	Key Scientific References
Cosmology - Universe Expansion	Quran 51:47	"And the heaven We constructed with strength, and indeed, We are [its] expander"	Hubble's discovery of cosmic expansion (1929); Big Bang cosmology; Universe expanding at ~70 km/s/Mpc	Weinberg (2008); Riess et al. (2019)
Cosmology - Big Bang	Quran 21:30	"Have those who disbelieved not considered that the heavens and the earth were a joined entity, and We separated them?"	Big Bang theory; Primordial singularity; Cosmic inflation	Guth (1997); Weinberg (2008)
Celestial Mechanics	Quran 21:33	"And it is HE who created the night and the day and the sun and the moon; all [heavenly bodies] in an orbit are swimming"	Kepler's laws; Orbital mechanics; Gravitational dynamics	Murray & Dermott (1999); Laskar (2008)
Gravitational Forces	Quran 13:2	"Allah is HE who raised the heavens without pillars that you can see"	Einstein's general relativity; Invisible gravitational forces; Dark matter scaffolding	Einstein (1916)
Atmospheric Protection	Quran 21:32	"And We made the sky a protected ceiling, but they, from its signs, are turning away"	Ozone layer UV protection; Magnetosphere deflection; Atmospheric meteor shield	Solomon (1999); Kivelson & Russell (1995)
Solar vs. Lunar Light	Quran 10:5	"It is HE who made the sun a shining light and the moon a light and determined for it phases"	Sun generates light via nuclear fusion; Moon reflects solar radiation (albedo ~0.12)	Clayton (1984); Hapke et al. (1996)
Oceanographic Barriers	Quran 25:53	"And it is HE who has released [simultaneously] the two seas, one fresh and palatable and one salty and bitter, and He placed between them a barrier"	Haloclines; Density stratification; Mediterranean-Atlantic interface; River-ocean boundaries	Bryden & Stommel (1984); Geyer & MacCready (2014)
Deep Ocean Darkness	Quran 24:40	"Or [they are] like darkneses within an unfathomable sea which is covered by waves, upon which are waves, over which are clouds"	Light attenuation in seawater; Photic zone (200m); Internal waves at density boundaries	Kirk (2011); Garrett & Munk (1979)
Marine Biodiversity	Quran 16:14	"And it is HE who subjected the sea for you to eat from it tender meat and to extract from it ornaments which you wear"	Marine fisheries provide 16% global protein; Ocean ecosystem services; Pearl and coral resources	FAO (2020); Costanza et al. (1997)

Scientific Domain	Quranic Reference	Verse Translation	Modern Scientific Discovery	Key Scientific References
Origin of Life	Quran 21:30	"And We made from water every living thing"	Abiogenesis in aqueous environments; Water as universal biological solvent; Life emerged ~3.5-4 billion years ago	Miller & Lazcano (1995); Orgel (1998)
Fingerprint Uniqueness	Quran 75:4	"Yes, [We are] Able [even] to proportion his fingertips"	Unique fingerprint patterns; Forensic identification; Probability <1 in 64 billion for identical prints	Galton (1892); Pankanti et al. (2002)
Embryological Development	Quran 23:12-14	"...sperm-drop...clinging clot...lump [of flesh]...bones...covered the bones with flesh..."	Embryonic stages: zygote → blastocyst → organogenesis → bone formation → muscle development	Moore & Al-Azzindani (1983); Sadler (2018)
Gender Determination	Quran 53:45-46	"And that HE creates the two mates - the male and female - from a sperm-drop when it is emitted"	Male XY chromosomes determine gender; Y chromosome from father determines sex	Gilbert (2013)
Mountain Stability	Quran 78:6-7	"Have We not made the earth a resting place? And the mountains as stakes?"	Isostatic equilibrium; Mountain roots extend 70-80km deep; Gravitational balance	Press & Siever (2001); Nelson et al. (1996)
Earth's Spherical Shape	Quran 39:5	"He wraps the night over the day and wraps the day over the night"	Earth's rotation; Spherical planet with day-night cycle; Gradual transition zones	Seidelmann et al. (2007)
Water Cycle	Quran 6:99; 25:48	"And it is He who sends down rain from the sky...winds as good tidings before His mercy...pure water"	Evaporation, wind transport, precipitation cycle; Hydrological processes	Eagleson (2002)

11. Discussion and Critical Analysis

11.1 Hermeneutical Considerations

The Qur'ān's alleged similarities to modern scientific discoveries should be studied in a hermeneutical way and not in a literal one. In a few instances the parallels have only been recognized after the relevant advances in science were made. An important question arises here, namely does the interpretation make visible what was already there in the text of the Qur'ānic or does it impose an additional scientific meaning on the Qur'ānic text? Such interpretations are, however, to be avoided, according to Ricoeur (1976). Likewise, there are Muslim scholars who believe that the Qur'ān is not a source of scientific and empirical information, but is actually a book of ethics and morality (Iqbal, 1930). This is a perspective that is not the same as the "concordist" approach which aims to establish links between the verses in the Qur'ān and contemporary scientific facts.

11.2 Theological Implications

The Qur'an and the concept of i'jaz (inimitability) are intertwined in this manner of knowable knowledge that was not available in the seventh century Arabia. This is a theological statement, not one that can be reached in the process of this study; the latter would require that simpler explanations (general and metaphorical language, the choice of translation, the choices of verses vs. known results, the way this study itself would not be able to prove that this is a valid exclusion).

The comparison to modern astronomy (Carroll and Ostlie, 2017) emphasizes the asymmetry: Today's science is based on models that are quantitative and testable, whereas the Qur'anic passages are qualitative and can be interpreted in different ways. If the parallels were useful in interfaith discussions, then it severely limits the strength the parallels could have for i'jaz.

11.3 Contemporary Developments

There are general descriptions of nature in the Qur'ān which can be talked about in connection with the contemporary science of today. The references to sea and marine life, for instance, can be compared with contemporary research on the deep-oceanic environments, which were formerly believed to be largely unsuitable for life (Ramirez-Llodra et al., 2010). These descriptions in the Qur'ān, however, are general and classical exegetes have given different readings to them. The similarity to contemporary scientific results is not to imply that the classical interpretations predicted future scientific results. The letters, instead, can be seen as a chance for additional consideration. Likewise, the ocean is mentioned in the context of God's creation and order in the Qur'ān, but not in the context of modern mechanisms of climate regulation. That is why these verses are not to be interpreted in just one scientific way. There are other possible links between the Qur'ān, quantum physics, and the field of consciousness studies, although these are speculative and in a state of uncertainty. While Guessoum (2011) agrees that meaningful interdisciplinary dialogue can be sustained without making strong scientific claims, he writes that a lack of proper scientific claims in such a context is a major problem. Thus, the connection between Qur'ānic descriptions and modern science must be treated carefully and appropriately with caution, instead of too much certainty, especially with regard to the development of the scientific evidence (Carroll & Ostlie, 2017).

12. Limitations

There are a number of limitations to this study. A selection of verses was chosen for their importance in current tafsir 'ilmi and literature, rather than a complete survey. The analysis is based on English translations and the selections of words in the translation might affect the extent to which a verse comes across as meeting a particular criterion. Several of the correspondences are retrospective in nature that is, verses are interpreted in terms of discoveries made quite a long time after the revelation and in some instances after the previous interpretation. Many verses are interpreted differently by classical and modern tafsir and many are given more than one meaning by the modern concordist readings, which are just one of a variety of possible interpretations. The conclusions mentioned in some of the scientific fields discussed are still preliminary and so the claim to correspondence is not definite, but is subject to the change of scientific knowledge. Thirdly, this study does not imply causation or intentional prediction: one does not have to be discovered first in order to be predicted intentionally.

13. Conclusion

The goal of the study was to understand selected passages of the Qur'ān on the subject of natural phenomena within the context of modern scientific discourse, and to pinpoint the boundaries of what can be read into the Qur'ān and science. The results, which are mainly in the field of oceanography, atmospheric barriers, the uniqueness of the fingerprint, celestial mechanics and marine biology, indicate that the meaning of many of the parallels is more a modern interpretation than a clear indication of exegesis of the classical time. These verses have been interpreted in a variety of ways: theologically, linguistically, metaphorically, and in a variety of later concordist readings, connections were made with specific scientific discoveries. The study thus draws some interpretive cautions: the first one being to consider the language and context of the Qur'ān as it was originally revealed, the second being that the Qur'an is, in general, qualitative, and the third is not to choose interpretations based on scientific knowledge after the fact. Such parallels are more aptly regarded as interpretive correspondence rather than scientific substantiations. In general, the study does not confirm but rather provides a comparative evaluation of the Qur'an–science relationships and points to the importance of setting methodological standards for evaluating such interpretations.

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