

# Study on the Possibility of Miracle in Qur'an Verses 55:19-22 of the Qur'an: How the Qur'an Has Revealed the Formation Process of Pearls and Coral from River to Sea

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ABSTRACT:

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A study was conducted to examine the miraculous nature of verses 55:19-22 in the Qur'an, using four key parameters: Explicitness, Validity, Accuracy, and Precedence. Through this analysis, the true meaning of the verses was studied. Further comparison with other verses revealed that the geological phenomenon described in these verses is where freshwater and seawater meet, forming a river plume. This river plume exhibits all of the characteristics mentioned in the verses as a barrier and point of interaction. Additionally, it provides essential elements such as Calcium for the formation of coral and pearls. Historical data was also examined to demonstrate that at the time of the Qur'an's revelation, it was not known that lime played a role in the structure of pearls and coral, nor was Calcium discovered yet. Therefore, it seems that these verses are a suitable candidate for being considered as the scientific miracle of the Qur'an.

KEYWORDS: Formation of coral; river plume; formation of pearl; Qur'an and science

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## 1. Introduction

The Qur'an is believed by Muslims to have divine origins and is considered a holy book that provides guidance for humanity. While it shares similarities with other scriptures, it is believed to go beyond them in its teachings. Although not a scientific text, the Qur'an discusses natural phenomena and the role of natural factors in their occurrence. This has sparked debate among contemporary thinkers, with both supporters and opponents of the idea. Therefore, studying the Qur'an from a scientific perspective is deemed significant.

The Qur'an contains scientific statements that surpass the knowledge of the time it was revealed and are now confirmed by scientific progress (Mu'addab, 2007). This serves as evidence of the divine origin or scientific miracle of the Qur'an. When studying these statements, scientists should consider factors such as Explicitness or The level of certainty in the accuracy of the statement, Validity or The level of certainty in drawing the conclusion from the statement, Accuracy The level of certainty in the reliability of the scientific information, Precedence or the level of confidence that the statement did not exist during the speaker or author's era and could not have been known through scientific progress and Authenticity or the level of certainty that the statement was made at the claimed time and by the specified speak (Talebpour, Rohani Mashhadi and Moradi 2022).

Some natural phenomena mentioned in the Qur'an are easily understandable, such as:

... We created you out of dust, then out of sperm, then out of a leech-like clot, then out of a morsel of flesh, partly formed and partly unformed... (Q.22:5)<sup>1</sup>

However, some require closer examination, like the verses:

He has let free the two Seas, meeting together: Between them is a Barrier which they do not transgress: Then which of the favours of your Lord will ye deny? Out of them come Pearl and Coral (Q. 55:19-22).<sup>2</sup>

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1. ... فَإِنَّا خَلَقْنَاكُمْ مِنْ تُرَابٍ ثُمَّ مِنْ نُطْفَةٍ ثُمَّ مِنْ عَلَقَةٍ ثُمَّ مِنْ مُضْغَةٍ مُخَلَّقَةٍ وَعَجَبٍ مُخَلَّقَةٍ ... (الحجج/5)

2. مَرَجَ الْبَحْرَيْنِ يَلْتَقِيَانِ بَيْنَهُمَا بَرْزَخٌ لَا يَبْغِيَانِ فَبِأَيِّ آلَاءِ رَبِّكُمَا تُكَذِّبَانِ يُخْرِجُ مِنْهُمَا اللُّؤْلُؤَ وَالْمَرْجَانَ (الرحمن/19-22)

In current work, the probability of a scientific miracle in verses 55:19-22 has thoroughly examined. Firstly, the precise wording of these verses carefully analysed. Next, whether the scientific phenomenon mentioned in these verses can be attributed to them or not, was investigated. In the third step, the scientific validity of the claim was evaluated. Finally, the precedence of this concerning human understanding during that period, was assessed. The score of each item and average score have also calculated.

## 2. Lexical Review

The exact meaning of the words *maraja*,<sup>1</sup> *al-baḥr*,<sup>2</sup> *yaltaqīyāni*,<sup>3</sup> *barzakh*<sup>4</sup> and *yabghīyāni*<sup>5</sup> need to be studied very precisely to clarify the meaning of the verses. The meanings of these words are summarized in Table 1.

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1. مَرَج
  2. البحر
  3. يَلْتَقِيَانِ
  4. برزخ
  5. يَبْغِيَانِ

**Table 1.** The meaning of the main words of the verses (Muṣṭafawī, 1989; Al-Jawharī, 1986; Ibn Fāris, 1979; Al-Fayyūmī, 1993; Ibn Manzūr, 1995).

Word	Meaning
<i>maraja</i> (M,R,I)	Arrival, moving away and stir. Send. It is the sending and launching of something in a natural flow and freeing it from constraints.
<i>al-baḥr</i>	The Sea. Unlike the land, it is known for its vastness and depth, and every great river is a sea.
<i>yaltaqīyāni</i> (L,Q,Y)	The act of everything that comes to meet another thing and contacts. Complete contact between two things. It is a meeting with connection, so there must be constraints. However, the concepts of coincidence, perception, and confrontation: they are effects of the original [act].
<i>barzakh</i>	A barrier between two things, as if there is a spacious gap of land between them.
<i>yabghīyāni</i> (B,GH,Y)	Strong intention. Cross the limit.

According to the meanings of the words, the verses are trying to express the meaning that the two bodies of waters come freely to a point or line into contact with connections, but no visible merging is seen due to the presence of a boundary and limit. Pearls and coral are extracted from both waters.

### 3. Geological Investigation

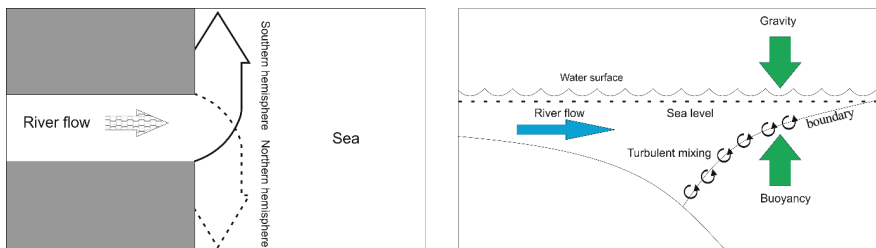
According to the verse (Q.25:53), these two great waters are sweet and salt waters or great rivers and seas or oceans.

It is He Who has let free the two bodies of flowing water: one palatable and sweet, and the other salt and bitter; yet has He made a barrier between them, a partition that is not to be passed (Q.25:53).<sup>1</sup>

1. وَ هُوَ الَّذِي مَرَجَ الْبَحْرَيْنِ هَذَا عَذْبٌ فُرَاتٌ وَ هَذَا مِلْحٌ أُجَاجٌ وَ جَعَلَ بَيْنَهُمَا بَرْزَخًا وَ حِجْرًا مَحْجُورًا  
(الفرقان/53)

A river plume is formed when a large river carrying freshwater flows into the salt water of the sea or ocean. This plume is a distinct mass of low-salinity water (sweet) that is released from the mouth of the river and enters the nearby coastal waters. In tropical systems, freshwater runoff mainly occurs during short-lived floods. These floods push freshwater through estuaries and into coastal waters, where it mixes (turbulence) with saltwater due to differences in density. The thickness of the freshwater layer is influenced by various factors such as wind stress, Coriolis force and gravity (Furnas 2011). More details about river plumes are presented in other references (Wolanski and McLusky 2011).

River or stream water discharged into coastal waters forms a shallow wedge near the mouth, which is accelerated away from the coast by gravity and buoyancy. The Coriolis force causes the flowing plume of river water to turn parallel to the coast, creating a buoyancy current. The plume eventually flattens and disperses due to turbulence as it moves along the coast (Figure 1) (Burrage et al. 2003). The exchanges between two waters does not limited to nutrients and exchange of marine organisms could occur (Giachini Tosetto et al. 2022). River plumes sweat waters mix with saline seawater so slowly that a sharp salinity gradient is produced at the plume-sea interface or border (Osadchiev et al. 2022).



**Figure 1.** A. The top view of plume in different hemisphere. B. Schematic section through a river plume. Figures were redesigned from (Burrage et al. 2003; Giachini Tosetto et al. 2022; and Osadchiev et al., 2022)

The verses indicate the presence of a barrier that prevents rivers and seas from crossing over, yet allows for mixing. It is evident that the boundary between the river plume and the sea/ocean allows for mixing, making plume water the subject of these verses. Therefore, verses 55:19 & 5:20 are about river water (plume) introducing seawater.

## 4. *The Formation of Pearls and Coral*

### 4.1. *The View of Science*

Corals, belonging to the class of Anthozoa within the phylum Cnidaria, are sessile invertebrates that exist in a vast array of species and abundance. They can be found living in colonies or solitaries. Although corals are present in all oceans worldwide, their distribution is limited to the latitudes between the Tropic of Cancer and the Tropic of Capricorn (Green 2001). The factors that determine their distribution include biotic elements such as coral's intra and interspecific competitions, corallivores, reproductive and recovery capacity, as well as their ability to withstand environmental stress. Abiotic factors such as light, water temperature, pH, salinity, turbidity, and depth also play a significant role (Ella Howes, Silvana NR Birchenough, 2018). Altering these parameters can have a severe impact on coral health and survival (Siro et al. 2022). The body structure of corals is uncomplicated and comprises a sac-like body with retractable tentacles that possess nematocysts, which are stinging cells. The coral has two tissue layers, namely the gastrodermis and epidermis, which are separated by a gelatinous matrix known as the mesoglea. These layers originate from the endoderm and ectoderm during the coral's life cycle (Barott et al. 2015). Corals can be categorized into two types based on their physical texture: hard coral and soft coral. Hard corals, also known as stony corals or scleractinian corals, possess an outer skeleton composed of calcium carbonate ( $\text{CaCO}_3$ ) arranged in a crystalline form called aragonite. The hermatypic stony corals that form reefs grow by shedding  $\text{CaCO}_3$  skeletons, which is an essential component of reef formation and structure. These hermatypic corals are crucial calcifying organisms that contribute to the biodiversity of coral reefs. Conversely, soft or ahermatypic corals have small spikes of calcium carbonate embedded within their bodies (Green 2001). The chemical composition of Pearl and Coral are presented in Table 2.

**Table 2.** Chemical composition of Pearls and Coral (Pearls and other organic gems, n.d.; Furnas, 2011)

	Compound	Percentage
Pearls	Calcium carbonate (CaCO <sub>3</sub> )	~ 86
	Water	2-4
	Conchiolin	~ 10
Coral	Calcium carbonate (CaCO <sub>3</sub> )	~ 100

Biom mineralization is a natural process that results in the formation of various solid inorganic structures by living organisms. This phenomenon is widespread and can be observed in prokaryotes, protozoa, algae, invertebrates, plants, and even pathological biominerals. The process involves converting ions into solid minerals through reaction and precipitation. Organisms use their synthetic organic macromolecules to manipulate the process of inorganic crystal nucleation, growth, and molecular arrangements to produce minerals with unique properties such as optical, magnetic, and mechanical properties (Arias and Fernández 2008; Zhang, Xie and Yan 2019).

Corals undergo biomineralization through a process called calcification; CO<sub>2</sub> molecules are absorbed by the ocean and combined with calcium ions to form calcium carbonate. This process is primarily carried out by calcifying organisms, including corals, molluscs, calcareous algae, foraminifera, sponges, and echinoderms, with corals being the primary producers of calcium carbonate precipitates. For corals to survive, they require specific physiological and environmental conditions. They thrive in temperatures between 18 and 30 °C and a salinity range of 32 to 40‰ (Souter and Lindén 2000).

The process of biomineralization in *Pinctada* pearl oysters, specifically fucata, involves the uptake of precursor ions such as Ca<sup>2+</sup> and HCO<sub>3</sub><sup>-</sup> from the surrounding environment. This is facilitated by the body epithelium or gill, which may also originate from food sources. The ions are then transported through the hemolymph and directed towards the outer mantle epithelium. Under precise regulation, significant amounts of calcium ions are continuously deposited onto the framework (Zhang, Xie and Yan 2019).

#### *4.1.1. The Role of Sea and River*

Coral and Pearls are constructed from calcium ions, so the formation of coral and pearls requires and consumes calcium ions. Therefore, the concentration of calcium in seawater will decrease over time if there is no supply of calcium. Coral and pearls cannot form in low concentrations of calcium. Without a continuous supply of calcium, their formation will decrease and stop. What are the sources of calcium of seawater?

Calcium (Ca) is supplied to the oceans mainly by rivers, but also by hydrothermal circulation, with calcium derived from the alteration of the continental and oceanic crust (Holland 1984; Milliman 1993; Schmitt, Chabaux and Stille 2003; Griffith et al. 2008). Rock weathering is estimated to be two-thirds of riverine calcium ions at a global scale. Over geological timescales, Ca is released from silicate minerals during weathering of both the continental and oceanic crust and transferred to the carbonate reservoir. According to a research, approximately one-third of the total calcium ion supplied by rivers to the oceans (Tipper et al. 2010). The balance of calcium ions depends on riverine completely.

Supplying of nutrients specially calcium is necessary for formation and growth of coral and pearls. Rivers and specially runoff waters are main suppliers of these nutrients, so they have a main and necessary role in the formation of coral and pearls (Gagan, Sandstrom and Chivas 1987; Devlin and Brodie 2005; Furnas 2011).

The formation of coral and pearls relies on the presence of calcium and other nutrients. These essential elements are obtained by coral and nacre from seawater, with the majority of calcium and nutrients being supplied by rivers.

#### *4.2. The View of the Qur'an*

According to the Qur'an, coral and pearls are formed through a process involving both river and sea waters. This suggests that there are certain elements present in these waters that are necessary for the formation of these precious gems. It is possible that these elements differ between the two types of water, or they may be the same. Regardless, they must be extracted from both sources and transferred to the pearls and coral for their formation.



#### 4.2.1. Precedence of the Verses

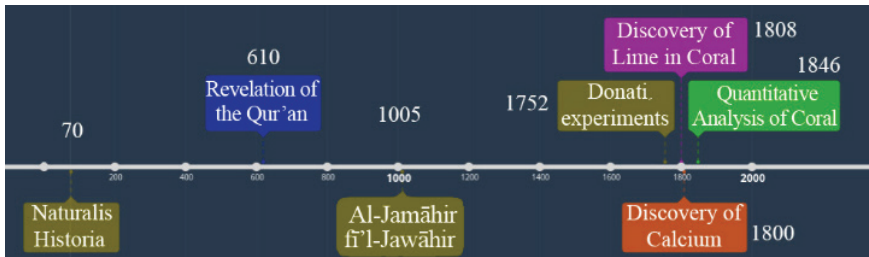
The focus of this discussion is on whether people during the time of the Qur'an revelation had knowledge about the formation of coral and pearls. To answer this question, it is necessary to examine historical data on their origin and formation.

Pliny the Elder (23-79 CE) in his book *Naturalis Historia* described coral's shapes, sizes, values, behaviour, types and usages but not about chemical composition or condition of formation (Pliny the Elder n.d.). The information about pearls is even more limited, and nothing about the composition of pearls is mentioned. Manusmriti, an old Indian book, mentioned pearls and coral without any details too. Bīrūnī (973-1048 CE) in his comprehensive book *Al-Jamābir fī'l-Jawābir* (*Kitāb al-Jamābir fī Ma'rifat al-Jawābir*) has discussed pearls very comprehensive and in details and supposed coral as pearls. He discussed names, characteristics, humidity, prices, correctness, essence, shells, occurrences, diving, etc. But nothing shows that he or other scientists or that era were aware of chemical composition of pearls (Bīrūnī 2001).

Centuries later, Donati examined the body of corals in his discoveries (Donati 1752). He attempted to convert the coral body to ash using fire but was unable to determine the origin of the coralline substance or the presence of lime or calcium. It was not until Hatchett's discovery in 1800 that it was revealed that nacre, pearls, and coral are made from lime (Hatchett 1800). Calcium was discovered by Humphry Davy in a series of experiments in 1808 (Davy 1808). He tried to reduce moist lime by electrolysis in various condition and ultimately discovered the calcium element. Davy conducted the experiments with equipment and knowledge that were not available until centuries. Silliman Jr. quantitatively analysed many corals and measured their calcium contents in 1846 (Silliman Jr. 1846). Following these discoveries, scientists recognize the impact of seawater's calcium ion concentration on Coral and Pearls formation. For example, Darwin thus asserts:

“It will, perhaps, be suggested, that the quantity of carbonate of lime in different parts of the sea, may regulate the presence of [Coral] reefs.” (Darwin 1842)

The timeline of this history is presented in Figure 2.



**Figure 2.** The timeline of history of knowledge about the formation of pearls and coral. The first development is in 1800.

Although there is no evidence to suggest that scientists during the time of the Qur'an revelation were aware of the existence of a lime-like compound in coral and pearls, it is possible that an unknown individual who did not publish any texts may have known about it. However, given the limited scientific knowledge and technology of that era, it is not possible that they were aware of the calcium's existence in corals, pearls, and seawater. Without this knowledge, they would not have been able to identify the process by which calcium moves from rivers to seawater via plumes or how it is extracted from seawater by coral and naces. Therefore, it can be concluded that the role of both rivers and seas in the formation of pearls and coral was not known during the time of the Qur'an revelation.

### 5. Comparison of Two Views

The verses state that coral and pearls are formed by the waters of rivers and seas. The scientific facts presented in section 4.1 confirm the accuracy of this statement. Notably, the verb *yakbruju*<sup>1</sup> (extract) is used in the verse. This can refer to how corals and Pinctadas extract elements from seawater, which is then obtained by the sea from river runoff. Extraction involves separating a part of something (in this case, ions) from the whole (water). The verses lacked clarity on the extracted element(s), which is mainly Calcium ion. The wording of these verses is scientifically sound and accurate, with no contradictions between them and scientific knowledge. The scores of Explicitness, Validity and Accuracy are 0.9/1, 1/1 and 1/1 respectively. These scores and the scores of Precedence and Authenticity are presented in Table 3. The overall

0.93/1 by formula was provided by Talebpour, Rohani Mashhadi and Moradi, 2022.

**Table 3.** The scores of main parameters of possibility of the miracle in verses.

Parameter	Score
Explicitness	0.9
Validity	1
Accuracy	1
Precedence	1
Authenticity	1
Overall	0.93

## 7. Conclusion

The first phenomenon described in the verses pertains to the meeting point of river plume/runoff water and sea/ocean. The descriptions in the Qur'an align with physics, too. Although the Qur'an's descriptions may have been far ahead of their time, this aspect was not studied here. The second phenomenon pertains to the formation of pearls and coral through extraction from both waters. The scientific facts and Qur'anic descriptions are completely similar. It should be noted that the Qur'an did not provide a detailed account of the entire process.

A survey of available historical data reveals that it was not possible, with the knowledge and equipment available at the time of the revelation of the Qur'an, to describe the formation of pearls and coral as accurately as stated in the Qur'an.

Achieving 100% certainty is difficult due to factors such as biases, limited information, and complexity. However, strong evidence can lead to confidence in propositions, as seen in scientific theories and legal cases. While 100% certainty may not always be possible, confidence can still be achieved through strong evidence.

The aforementioned evidence shows that verses Q. 55:19-22 possess all factors of a miracle with score of 0.93/1. However, further research is necessary before claiming it as a miracle, and it is important to consider other scientists' opinions on this matter.

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