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A Critical Analysis of the "Miracle" of Iron's Descent (Q. 57:25): A Scientific, Exegetical, and Historical Perspective

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ABSTRACT: Original Paper

The Holy Qur'an, in addition to its primary purpose of guiding humanity, contains numerous scientific references that were not fully understood at the time of its revelation. Verse 25 of Surah al-Ḥadīd refers to the sending down of iron. The use of the verb *anzala* (to send down) instead of more commonly used verbs such as *khalaqa* (to create) and *jaʿala* (to make) has led to various interpretations of this verse throughout history. This research employs a descriptive-analytical method to examine the concept of the sending down of iron (*inzāl al-ḥadīd*) and its strong nature (*ba's shadīd*), as well as its relation to new scientific findings regarding the origin of iron on Earth. Additionally, it investigates whether people at the time of the Qur'an's revelation had any knowledge of the extraterrestrial origin of iron.

Contrary to some extreme approaches to the scientific interpretation and miracles of the Qur'an in recent centuries, this research advocates a balanced perspective that utilizes scientific findings, without any imposition, to better understand the verses of the Qur'an. Recent scientific discoveries indicate that iron is primarily produced in the cores of massive stars, and it cannot be produced in the solar system. Therefore, the use of the verb *anzala* may allude to the extraterrestrial origin of iron. The results of this research reveal

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that, from a scientific standpoint, various phenomena are involved in the process of iron's incorporation into Earth that could embody the concept of "sending down," including the production of iron in massive stars and its transfer to Earth through certain cosmic processes, the collision of iron-rich meteorites and asteroids with Earth, and the sinking of iron towards the Earth's core. Regarding the knowledge of people about the extraterrestrial origin of iron at the time of revelation, although it has been claimed that the term used for iron in ancient Egypt means "metal from heaven," the findings of this research indicate that this claim is merely a possibility and, despite extensive research, has not been definitively verified.

KEYWORDS: The Qur'an and science, Qur'anic cosmology, Scientific exegesis, Scientific miracle, Origin of Iron, Metal from heaven.

1. Introduction

The Noble Qur'an, while primarily aimed at guiding humanity, also contains numerous scientific allusions that were not apparent to its original audience at the time of revelation. With advancements in modern science, the profound meanings of these verses have become clearer, attesting to the authenticity of this Holy Scripture. Although extremisms have been observed in the past two centuries, during which the scientific interpretation of the Qur'an has gained prominence, the approach of scientific exegesis remains a valuable tool for interpreting the scientific references within Qur'anic verses (Jafari 2023; Zare et al. 2023; Nasiri Gheydari 2022; Moradi 2022; Koutb 2022; Barati & Paymard 2022; Shojaie & Mazaheri Tehrani 2022; Besharati & Besharati 2022). Islamic scholars have proposed three main interpretations of this approach: extracting science from the Qur'an, imposing scientific concepts onto the Qur'an, and utilizing science to enhance the understanding of verses (Reza'i Isfahani 2013). The first two approach, to some extent, lead to incorrect subjective interpretations, as the interpreter attempts to impose their own views on the Qur'an rather than utilizing contemporary knowledge to better comprehend the verses. The third approach, however, can be considered the correct approach to scientific exegesis, as it enables the interpreter to achieve a deeper and more comprehensive understanding of the verse through the application of various sciences.

It is essential to note that while the scientific interpretation of the Qur'an and its scientific miracles share some common ground, they are distinct concepts. The primary objective of scientific interpretation is to enhance our understanding of the Qur'anic verses in light of contemporary scientific discoveries (Mazaheri Tehrani et al. 2016). Conversely, the purpose of

discussing the scientific miracles of the Qur'an is to demonstrate the authenticity of this sacred text. In other words, the fact that humans were unable to comprehend certain scientific concepts mentioned in the Qur'an at the time of its revelation indicates that this book cannot be a product of human knowledge. Only the Creator of the universe, who has comprehensive knowledge of all its intricacies, could have been aware of these scientific facts and included them in His divine scripture. Therefore, scientific interpretation of the Qur'an is broader in scope than scientific miracles. However, scientific interpretation can only be considered a scientific miracle when three specific conditions are met: first, the verse should be explicit in the intended meaning; second, The claimed scientific material should be valid and widely accepted; third, The scientific material should not have been discovered at the time of the revelation of the Qur'an and there should not be any knowledge about it in scientific circles or among the general public (Talebpour et al. 2022).

Verse 25 of Surah al-Ḥadīd has been the subject of much scientific inquiry and even considered a miraculous statement by some. The verse introduces iron as one of God's great blessings, offering numerous benefits to humanity. A particularly intriguing aspect of this verse is the emphasis on God 'sending down' iron, rather than creating it, as is the case with other blessings. The Arabic verb used, *anzala*, typically carries the connotation of sending down or lowering. Scholars have offered various interpretations of *anzala* over the centuries. Some have understood it as a metaphorical descent, signifying the creation or provision of iron for human use (Ibn ʿĀshūr 1999, 27:375). However, contemporary scholars, drawing on recent scientific findings that suggest iron could not have originated on Earth or within our solar system, have interpreted *anzala* literally, arguing that the verse alludes to the extra-terrestrial origin of iron (al-Bultaji 2006). While this interpretation has been mentioned in a few contemporary commentaries (Tantawi Jawhari 2004, 24:104), it has not been widely adopted by most traditional or contemporary exegetes. Some contemporary scholars who have mentioned this view have considered it untenable (Tabataba'i 1996, 19:325; Makarem Shirazi 2001, 23:373). Scientific perspectives on the origin of Earth's iron are also varied and continue to be debated. Given that human knowledge about the origin of iron was limited at the time of the Qur'an's revelation, some scholars have interpreted the statement about iron being 'sent down' as a scientific miracle (al-Bultaji 2006). However, this claim requires careful scrutiny and can only be considered valid if it meets the three criteria for a scientific miracle.

To date, several studies have focused on the use of iron in the Qur'an, including two interdisciplinary investigations related to the Dhul-Qarnain

Dam, which incorporated iron and copper (Moghaddasi 2022; Miri & Akbari 2014). However, these studies have not addressed the origins of iron or its descent. Many researchers have specifically examined verse 25 of Surah al-Ḥadīd, with some studies exploring its interpretations and the claims of scientific miracles associated with it. A common shortcoming of these works is their brief treatment of the verse, lacking a thorough linguistic, interpretive and historical analysis (Ghernaout 2017; Yimer 2015; Nejati 2019). Additionally, certain studies have failed to comprehensively explore potential scientific implications, often neglecting to present scientific evidence in a rigorous and well-documented manner (Tantawi Jawhari 2004; al-Ubaydi 2005; al-Hajj 2003; al-Bultaji 2006).

This research aims to address the following questions: What is the intended meaning of "sending down iron"? Can this phrase be interpreted as the physical descent of iron? What do recent scientific findings reveal about the origin of iron on Earth? Did humans possess knowledge about the origin of iron prior to the Qur'anic revelation? To answer these questions, the study will conduct a linguistic and interpretive analysis of the relevant verse, exploring various interpretations of "sending down iron." It will also investigate scientific findings regarding the origin of iron on Earth and assess their compatibility with the Qur'anic statement. Additionally, we will examine the history of iron discovery and the terminology used to describe it in order to gain insight into human understanding of iron at the time of the revelation.

2. Linguistic and Interpretive Analysis

The linguistic and interpretive analysis provides a crucial foundation for understanding the nuances and deeper meanings embedded within the text. By closely examining the language and exploring various interpretive frameworks, we can uncover the underlying messages and implications related to the concept of "sending down iron." This section will delve into the specific wording and potential interpretations, offering insights into their contribution to our overall understanding of verse 25 of Surah Al-Ḥadīd, which states:

لَقَدْ أَرْسَلْنا رُسُلَنا بِالْبَيِّناتِ وَ أَنْزَلْنا مَعَهُمُ الْكِتابَ وَ الْميزانَ لِيَقُومَ النَّاسُ بِالْقِسْطِ وَ أَنْزَلْنَا الْحَديدَ فيهِ بَأْسٌ شَديدٌ وَ مَنافِعُ لِلنَّاسِ وَ لِيَعْلَمَ اللَّهُ مَنْ يَنْصُرُهُ وَ رُسُلَهُ بِالْغَيْبِ إِنَّ اللَّهَ قَوِيٌّ عَزيزٌ (الحدید/۵۷/۲۵)

Certainly We sent Our apostles with manifest proofs, and We sent down with them the Book and the Balance, so that mankind may maintain justice; and We sent down iron, in which there is great might and uses for mankind, and so that Allah may know those who help Him and His apostles in [their] absence. Indeed Allah is all-strong, all-mighty (Q. 57:25).

While the revelation of the Book and the balance for spiritual purposes is understandable, the statement that iron, a hard substance, was also 'sent down' requires further investigation. To comprehend the meaning of this verse, it is essential to understand the meanings of key words.

2.1. Al-Ḥadīd

The term *al-ḥadīd* originates from the root Ḥ,D,D which means to prevent and restrain (al-Jawharī 1990, 1:245; al-Zabīdī 1993, 8:8). In linguistic terms, *ḥadd* refers to the boundary and limits of anything (al-Farāhīdī 1988, 3:19; Ibn Manẓūr 1993, 3:140). Al-Rāghib al-Iṣfahānī (1991, 221) states that *ḥadd* means the intermediary and boundary between two things, which prevents their mixture. Ibn Fāris (1979, 239) believes that the root *ḥadd* encompasses two main meanings: prohibition and the extremity of something. The phrase *ḥudūd Allāh* refers to the boundaries between God and humanity, which should not be transgressed. Additionally, *ḥadd al-Sikkīn* refers to the sharpening of a knife with a stone (Ibn Durayd 1986, 1:95). The term *al-ḥadīd* is understood to signify a well-known metal, and a person who works with it is called *ḥaddād* (al-Farāhīdī 1988, 3:20). In the context of the meaning of *al-ḥadīd* in lexicons, it has been stated that *al-ḥadīd* is simply the well-known object that requires no definition, and it has been named for its hardness, strength, and restraining power (Ibn Fāris 1979, 239; al-Jawharī 1990, 1:245; al-Zabīdī 1993, 8:8). This indicates that the meaning of this word is clear and evident, and the pre-Islamic Arabs were well acquainted with it in their daily lives. Furthermore, *al-ḥadīd* is also used to describe a keen and sharp gaze, as it prevents things from remaining concealed (Q. 12:22). It is also referred to as *al-ḥadīd* due to its articulate and decisive nature (Q. 33:19), as it defends a person and prevents defeat in discourse (Qorashi 1998).

2.2. Inzāl

The term *inzāl* derives from the root N,Z,L which means to descend from above, to fall, or to alight (Ibn Fāris 1979, 417). This concept can apply to both material and spiritual matters (Mustafawi 1989, 12:86). Ibn Manẓūr (1993, 11:656) also employed the terms *ḥulūl* and *wurūd* to define *inzāl*. Al-Rāghib (1991, 799) describes the meaning of *nuzūl* as falling from a height, and in explaining *inzāl*, he states that when it is used concerning a blessing, it refers to the granting of that blessing to a servant, which may involve either the descent of the blessing itself or the descent of the means and guidance through that blessing, such as iron or clothing.

In another definition, the term *nuzūl* is interpreted as *inḥidār*, which signifies the act of flowing down from a height to a lower position, encompassing both material and spiritual descent. Regarding the distinction between *inzāl* and *tanzīl*, it has been noted that *inzāl* considers the direction of the act originating from the doer, while *tanzīl* focuses on the occurrence of the act and its relation to the recipient (Mustafawi 1989, 12:86). *Nuzūl* essentially means the act of descending or coming down. In its original sense, it refers to the decline or descent from a high place (al-Zabīdī 1993, 15:728). Al-Ṭurayḥī (1996, 5: 480) also equates the *inzāl* of iron to creation and establishment, asserting that the use of the term *inzāl* signifies that the creation of these things is analogous to the descent of God's commands from heaven to earth. Qorashi (1998), referencing the verse (Q. 15:21), which states that the treasures of all things are with God, and He sends down an ample provision of everything, believes that placing anything on earth can be referred to as *inzāl*, as the management of all comes from God. Consequently, the application of *inzāl* to iron, livestock, clothing, and messengers is deemed appropriate due to their placement on earth. In the Qur'an, the descent of material items is mentioned, such as water, rain, sustenance, hail, clothing, livestock, and iron (Q. 2:22; 45:5). Likewise, the descent of non-material and spiritual subjects such as wisdom, scripture, the Qur'an, the Torah, the Gospel, and angels are addressed (Q. 26:193; 17:82).

2.3. Ba's

The term *ba's* refers to severe conditions in war or hardship, and the phrase *rajul dhū ba's* means a brave man (al-Farāhīdī 1988, 7:316). It is also used to signify hardship, torment, and poverty (Ibn Manẓūr 1993, 6:20), with the comprehensive meaning encompassing difficulty and unpleasantness (Qorashi 1998). Furthermore, *bu's* pertains to the hardship of life (Ibn Fāris 1979, 328).

2.4. Inzāl al-Ḥadīd

Various commentators have proposed multiple interpretations for the phrase *inzāl al-ḥadīd*, which we will examine in this section.

2.4.1. Hierarchical Descent of Iron

Some commentators believe that the descent of iron refers to a hierarchical descent rather than a physical descent (Tabataba'i 1996, 1:172; Quṭb 1991, 6: 3495; Makarem Shirazi 2001, 23:373; Saqafi Tehrani 2019, 5:150). Commentators such as Tabataba'i and Quṭb have likened it to the descent of animals, representing a transition from the world of the unseen to

the world of observation and matter. To support this view, they refer to the verse Q. 15:21, which states: "The treasures of all things are with Us, and We send them down in due measure." Thus, the creatures are believed to exist in reservoirs in the unseen realm before descending to the Earth in specific measurements and appropriate forms for the material world. This has been termed a hierarchical descent of creatures from a higher realm to the world, which does not imply a physical descent (Tabataba'i 1996, 1:172). Consequently, these commentators have rejected the notion of a physical descent for iron (Makarem Shirazi 2001, 23:373). Quṭb, referring to the context of the verse, asserts that since the descent of the Book and the Balance is mentioned alongside the messengers at the beginning of the verse—which is intended to imply a hierarchical descent—the descent of iron in the middle of the verse also signifies a hierarchical descent (Quṭb 1991, 6:3495).

2.4.2. Creation of Iron

Many interpreters hold that the expression *inzāl al-ḥadīd* is like the term *inzāl* as applied to other materials such as clothing (Q. 7:26) and livestock (Q. 39:6), meaning the creation and emergence of iron (al-Rāzī 1999, 29:471; al-Ṭabrisī 1993, 9:363; al-Zamakhsharī 1986, 4:481; Sabzewari Najafi 1998, 1: 546; al-Mazhari 1991, 9:202; Husseini Hamedani 1983, 16:202). Some have emphasized that the term *inzāl* here does not imply sending down from the heavens to the Earth (Tabataba'i 1996, 19:325; Makarem Shirazi 2001, 23:373). A narration from ʿAlī ibn abī Ṭālib is cited as supporting this interpretation, in which he indicates that the *inzāl* of iron refers to its creation (al-ʿArūsī al-Ḥuwayzī 1995, 5:250). Ibn ʿĀshūr (1999, 27:375) likewise identifies *inzāl* as a metaphor for the creation of iron.

2.4.3. Provision of Means and Causes

Some scholars interpret *inzāl* of items such as iron, clothing, and livestock as the descent of means and causes. They assert that *inzāl* is derived from *nuzul*, which refers to something prepared for hosting a guest. Al-Ṭabrisī (1993, 9:363) and al-Mazhari (1991, 9:202) have cited that *inzāl* means preparing and arranging for a guest and granting favors. This implies that God did not send down these materials directly, but rather prepared the means for their existence and usage for humanity (al-Rāzī 1999, 14:221). Thus *inzāl al-ḥadīd* means we have honored you with iron and prepared it in the mines for you (al-Rāzī 1999, 29:471; al-Ṭabrisī 1993, 9:363). Some commentators also reconcile these interpretations by suggesting that the descent of iron can refer to both its creation and its provision (Tantawi 1985, 14:228; al-Zamakhsharī 1986, 4:481).

2.4.4. Narrative Interpretations

According to a narration from Ibn ʿAbbās, what is meant by the *inzāl al-ḥadīd* is the iron that was sent down with Prophet Adam at the time of his descent to Earth, which includes anvil, hammer, and tongs (al-Rāzī 1999, 29:471; al-Ṭabrisī 1993, 9:363). Additionally, there is a narration from the Prophet (PBUH) stating that iron, along with three other blessings—namely water, fire, and salt—was sent down from the heavens (al-Rāzī 1999, 29:471; al-Ṭabrisī 1993, 9:363; al-Zamakhsharī 1986, 4:480; al-ʿArūsī al-Ḥuwayzī 1994, 5:250). In another narration from Ibn ʿAbbās, it is stated that the reference to *al-ḥadīd* in this verse is to the sword Dhulfaqār, which God sent down from the heavens for the Prophet, and that he bestowed it upon ʿAlī ibn abī Ṭālib (Borujerdi 1987, 7:74). A narrative from ʿAlī ibn abī Ṭālib indicates that the term *al-ḥadīd* in this verse refers to the sword (al-ʿArūsī al-Ḥuwayzī 994, 5:189), and the cause behind the sending down of the sword is victory and triumph over enemies who rose up against the Book, the Balance, and the Prophets (as mentioned in the beginning of the verse) (Modarresi 1998, 15:104; Fadlullah 1998, 22:48).

2.4.5. Physical Descent

A few contemporary commentators, taking into consideration new scientific theories, have posited that iron, like rain, has descended to Earth. During the formation of the Earth, iron existed in the atmosphere as vapor due to extremely high temperatures and gradually fell to Earth as rain as it cooled, permeating into the Earth's layers and resulting in the formation of mines (Tantawi Jawhari 2004, 24:98; Sadeqi Tehrani 1986, 28:171). Sadeqi Tehrani (1986, 28:171), while alluding to the descent of iron from the sky to Earth like rain, also proposes the meaning of hierarchical descent. He states that God is not a physical being who resides in the heavens to send iron down from Himself; thus, this type of descent is of the same nature as the hierarchical descent of revelation. However, these two meanings—hierarchical descent and physical descent—are not contradictory and can each be valid in their own context.

3. The origin of iron from a scientific point of view

This section explores the origin of iron from a scientific perspective, examining the cosmic processes that led to its formation.

3.1. Production of Iron in Massive Stars

In 1957, Margaret and Geoffrey Burbidge, William Fowler, and Fred Hoyle published a pivotal article that transformed our understanding of how chemical elements are formed. Prior to this work, astronomers believed that different elements were created during the Big Bang and that their abundances did not change over time. However, Hoyle and his colleagues demonstrated that most elements heavier than lithium are synthesized within stars. They proposed a sequence of fusion reactions that occur at various stages of a star's life cycle, progressively generating heavier elements (Burbidge et al. 1957).

When a star converts a significant portion of its hydrogen into helium, it begins to cool. Subsequently, the core of the star contracts under gravity, which leads to an increase in temperature. Once temperatures reach approximately 100 million Kelvin, fusion of helium atoms becomes possible, resulting in the formation of carbon, oxygen, and neon. Beryllium, boron, nitrogen, and fluorine are also produced; however, due to their low abundance and high reactivity, they are often consumed in subsequent fusion processes. When all helium is exhausted, the same process repeats. The cooled star's core continues to contract and heat up, initiating a new fusion process. Carbon and oxygen undergo fusion to form sodium, magnesium, silicon, and sulfur, gradually building the periodic table from this unstable furnace. Thus, the creation of elements, known as nucleosynthesis, leads to the formation of Earth and everything on it; consequently, only hydrogen and a small amount of helium, along with trace amounts of other light elements (the primordial elements), are products of the Big Bang, while the rest of the elements are synthesized in stars. When the core temperature of a star reaches about 3 billion Kelvin, iron is produced through nuclear fusion processes, marking the final stage of element creation; this is because iron has the most stable nucleus against fusion, meaning no energy is released from fusing iron nuclei. Heavier elements are formed in the outer regions of the star. Neutrons emitted from fusion reactions, under very specific and high-energy conditions, such as during supernova explosions, become trapped in nuclei, creating elements heavier than iron. When a massive star runs out of fuel for fusion, its core collapses again, and the resulting shock wave from this collapse propagates outwards, causing the star to explode and transition into a supernova, dispersing its elements throughout the cosmos (Woosley 2005; Ball 2004; Cox & Cohen 2011).

3.2. Iron in the Solar Nebula

The solar nebula, which formed about 4.6 billion years ago, was made from the remnants of earlier generations of stars, including materials ejected by supernovae. As gas and dust in the interstellar medium accumulated under gravity, the solar nebula formed, retaining the heavy elements that had been previously synthesized in the core of other stars, including iron. In essence, the iron found in the solar nebula was synthesized in the remarkably high-energy environments of massive stars and subsequently dispersed into the interstellar medium through supernovae and other stellar processes (Woosley 2005). Currently, the core of the Sun reaches temperatures of about 15 million Kelvin. In this environment, hydrogen nuclei (protons) fuse to form helium. While heavier elements can be produced through sequential fusion stages (for example, from helium to carbon and from carbon to oxygen, and so on), but the temperature and pressure required for iron fusion are not attainable in the Sun's core and in stellar environments like Sun.

3.3. Iron on Earth

Iron, one of the most abundant elements on Earth, has a complex and fascinating origin that is deeply intertwined with extraterrestrial events. The source of iron on Earth extends beyond these initial formations; it is also deeply connected to extraterrestrial events. Meteorites, particularly iron meteorites, serve as remnants of the metallic cores of differentiated planetesimals that formed in the nascent solar system. According to Scott (2020), these planetesimals underwent melting due to radioactive decay, leading to the segregation of metallic iron into their cores. Subsequent catastrophic collisions fragmented these bodies, sending their iron-rich cores through the solar system and eventually towards Earth.

The question arises as to why the Moon has a lower percentage of iron than Earth, despite both bodies being impacted by the same asteroids and meteorites. New experiments reveal that during these high-velocity impacts over 4 billion years ago, the asteroids were vaporized into an iron mist. This mist was propelled with enough velocity to escape the Moon's gravity but was retained by Earth's stronger gravitational pull. As a result, while both the Earth and the Moon experienced similar impacts, Earth captured the iron mist and incorporated it into its mantle, leading to a higher iron concentration. In contrast, the Moon, having a lower gravitational force, could not retain the iron mist, resulting in its lower iron content (Kraus et al. 2015). Examining the extraterrestrial contributions to Earth's iron reveals further intriguing connections. Native iron discovered in terrestrial rocks shares compositional similarities with iron particles found in meteorites,

reinforcing the notion of a common origin rooted in the early solar system's gas and dust cloud (Pechersky et al. 2017).

3.4. Iron of the Earth's Core

The processes that led to the formation of iron meteorites are primarily linked to impact events. Impact melting, where high-energy collisions between molten planetesimals resulted in the creation of metallic fragments, played a pivotal role in this context (Scott 2020). Studies of pallasites, a type of meteorite, support this hypothesis, indicating that their formation was also heavily influenced by such energetic impacts (Bennett et al. 2022). While meteorite impacts are indeed a significant source of iron, there are indications that native iron found on Earth may have originated from other mechanisms. The differentiation of Earth's mantle, for instance, implies a more complex interplay of sources contributing to the iron we find today (Pechersky et al. 2017). This aligns with theories suggesting that Earth's core formed through the segregation of metallic iron during the planet's early differentiation, a process driven by immense impacts. These impacts contributed to the dissolution of iron oxides, which played a critical role in determining the core's density and composition (Wood 2011). The conditions under which the Earth's core formed, specifically the temperature and pressure, greatly influence iron isotope ratios. For instance, higher temperatures during core formation led to less fractionation of iron isotopes, resulting in a near-chondritic composition in the Earth's mantle (Elardo & Shahar 2017).

New research published in Nature Communications challenges the long-held belief that Earth's unique iron isotopic composition stems from its core formation billions of years ago. The study suggests that higher levels of heavy iron isotopes on Earth compared to other celestial bodies may have developed later, potentially due to a significant collision that vaporized lighter isotopes or through the movement of heavy isotopes from the mantle to the crust. Researchers found a notable disparity in the iron isotope ratios between Earth and extraterrestrial rocks, leading them to propose alternative explanations for the isotopic anomaly. By simulating high-pressure conditions akin to those during Earth's core formation using a diamond anvil cell, the team revealed that traditional theories may not fully account for these isotopic differences (Liu et al. 2017).

3.5. Stability of Iron

The formation of atomic nuclei from protons and neutrons releases a

significant amount of energy, known as nuclear binding energy. This energy release contributes to the stability of the nucleus, and an equivalent amount of energy is required to separate the nucleons (protons and neutrons) within the atomic nucleus. As mentioned, the primarily abundant elements produced during the Big Bang are hydrogen and helium, along with trace amounts of other light elements. The majority of the other elements in the universe, including heavier ones, are synthesized in stars through various nuclear fusion processes. Iron, specifically iron-56, is the most stable nucleus in terms of binding energy per nucleon, which means that fusing iron nuclei does not release energy. In fact, fusing elements heavier than iron requires an input of energy, which signifies a crucial threshold in stellar nucleosynthesis. Therefore, when a star's core predominantly consists of iron, fusion processes are no longer energetically favorable (Woosley 2005). The relationship between the average binding energy per nucleon and mass number produces a curve known as the Binding Energy Curve (figure 1). This curve illustrates how binding energy varies with nucleon number, highlighting iron's position as the element with the highest binding energy per nucleon,[1] indicating its relative stability.

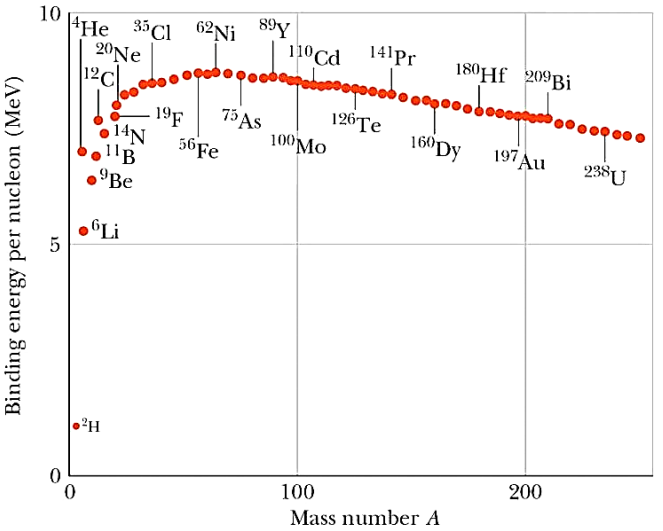

Figure 1. Binding energy per nucleon (https://www.asc.ohiostate.edu/kagan.1/phy367/Lectures/P367_lec_14.html)

1. It is important to distinguish between total binding energy and binding energy per nucleon. Nickel-62 has a greater total binding energy due to its larger number of nucleons; however, its binding energy per nucleon is slightly lower than that of Iron-56. So, while Nickel-62 is indeed stable and has a high binding energy, Iron-56 holds a critical place for energy production in stellar processes due to its favorable binding energy per nucleon. This is crucial in nuclear physics, particularly when considering fusion processes in stars.

4. Iron in Antiquity

Iron artifacts date back to around 3000 B.C., with evidence of iron being utilized in ancient Egypt and Mesopotamia. The earliest known use of iron was in the form of meteoric iron, which is iron that originates from meteorites and is primarily composed of iron and nickel. The ancient Egyptians fashioned tools and jewelry from this material, as it was readily available in some regions (Rehren et al. 2013; Marchant 2013). In the Near East, references to iron and meteorites appear in historical texts, but the origins of the terms used for iron in this region are intricate and largely unverified, despite various studies (Johnson et al. 2013). In the third millennium B.C., there are mentions of KU.AN in Mesopotamian writings, which may denote iron, although it could also refer to tin (Maxwell-Hyslop 1972; Bjorkman 1973). The term AN.BAR is found between 2000 and 1500 B.C., with earlier uses of the AN sign implying iron (Bjorkman 1973). However, there are also indications that the Hittites referred to the sky as iron. Consequently, not every ancient reference linking iron to the sky confirms a meteorite association; they could merely describe light or draw a parallel between the sky's color and the luster of metallic iron (Johnson et al. 2013).

While some literature consistently posits that early terms for iron stem from a phrase meaning "metal from heaven," it is crucial to address this assertion. The Sumerogram AN.BAR, interpreted as "iron," does not translate to "metal from heaven." Although AN may signify "heaven," BAR possesses over 160 potential meanings, none of which imply "iron" or "metal" (Bjorkman 1973). The Akkadian term parzillu, which means "iron," remains of unknown origin; experts largely agree it is a foreign word, not belonging to Semitic or Indo-European languages. Attempts to linguistically link parzillu with AN.BAR lack persuasion, particularly since both appear in literature around the same timeframe (Bjorkman 1973). Earlier Sumerian texts do utilize AN on its own to indicate iron, but the intended reading of the AN sign in these contexts is uncertain. The Sumerogram KU.AN was understood as amutu in specific instances, possibly denoting "meteoritic iron." Nevertheless, in the bilingual Rimush inscription, KU.AN corresponds to AN.NA in the Akkadian column, with AN.NA typically meaning "tin," which may vary in that particular inscription, raising doubts about the notion of "metal from heaven" (Bjorkman 1973).

In ancient Egypt, the term for meteoritic iron, bia' n pet, which translates to "iron of heaven," does not appear until the 19th Dynasty, around 1320 B.C., which is at least 2,000 years after meteoritic iron's initial use in Egypt. Interestingly, this phrase applies to all iron, not solely meteoritic iron. The

early term bia', found in records from the third millennium B.C., appears to refer to both meteoritic iron and iron produced from ores, as well as meteoric material in general (Harris 1961). Moreover, bia' in ancient Pyramid Texts may not even specifically relate to iron. Thus, the phrase "iron of heaven" cannot be understood as an earlier description in this setting (Bjorkman 1973). Additionally, LaPaz's assertion that the "earliest Egyptian hieroglyphic term for iron (min) is a striking representation of the distinctive teardrop shape of a falling fireball" (LaPaz 1969) is incorrect since min is the usual determinative for "bronze" (Gardner 1957).

In summary, while certain interpretations propose a link between the ancient Egyptian term for iron and the concept of "metal from heaven," this is more of a possibility than an established fact. There is considerable evidence and scholarly agreement suggesting that the connections between iron, its nomenclature, and celestial bodies are more intricate than a simplistic interpretation of "metal from heaven."

5. Conclusions

This study has examined the multifaceted interpretations of the verse Q. 57:25, particularly the concept of "sending down iron." Through rigorous linguistic and exegetical analysis, alongside an exploration of scientific perspectives, we have sought to elucidate the profound meanings and implications of this verse. Historically, various interpretations of the phrase *inzāl al-ḥadīd* have emerged. Some scholars view it as a hierarchical descent of iron from an unseen realm to the material world, while others interpret it metaphorically, likening it to the creation of iron. Additionally, some interpretations suggest that the verse refers to God preparing iron as a resource for humanity. Finally, a few contemporary interpretations have posited that iron may have physically descended from the sky, aligning this idea with current scientific understandings.

By examining the Qur’anic text in conjunction with scientific findings, we explored the possibility that the verse alludes to the extraterrestrial origin of iron. Iron is primarily synthesized within massive stars through nuclear fusion, culminating in the formation of iron, which represents the end of energy-releasing fusion. The unique stability of iron, characterized by the highest binding energy per nucleon, has significant implications for stellar evolution and the abundance of elements in the universe. This stability can be interpreted as the *ba's shadīd* of iron mentioned in the verse.

When massive stars exhaust their fuel, they undergo supernova explosions, dispersing heavy elements, including iron, into the interstellar medium. The remnants of these stellar explosions, enriched with iron,

eventually contribute to the formation of new stars and planetary systems, such as the solar nebula. Earth, as a product of this cosmic recycling, inherited its iron from the remnants of earlier generations of stars. This process can be seen as a form of the descent of iron referenced in the verse. Earth's iron is derived from a combination of sources, including accretion from the early solar nebula and impacts from iron-rich asteroids and meteorites, which contributed to its overall iron content. The collision of asteroids and meteorites containing iron can also be interpreted as a kind of the descent of iron. As the planet formed, heavy metallic iron segregated out due to the immense impacts, influencing the composition and density of the core. The process of accumulating iron in the earth's core can also be another form of iron's descent.

For a scientific interpretation to be considered a miracle, three specific conditions must be met: first, the verse must be explicit in its intended meaning; second, the scientific material must be valid and widely accepted; and third, the scientific material should not have been known at the time of the Qur'anic revelation. We have demonstrated that the first two conditions are satisfied; however, the third condition presents challenges.

While some literature suggests that early terms for iron stem from a phrase meaning "metal from heaven," it is essential to address this assertion critically. Although references to iron and meteorites appear in Near Eastern historical texts, the origins of terms used for iron in this region are complex and largely unverified. While certain interpretations propose a connection between the ancient Egyptian term for iron and the notion of "metal from heaven," this remains a possibility rather than an established fact. There is substantial evidence suggesting that the relationships between iron, its nomenclature, and celestial bodies are more intricate than a simplistic interpretation of "metal from heaven."

In summary, this study highlights the potential for a scientific interpretation and miracle of the verse Q. 57:25 that aligns with contemporary knowledge about the origin of iron while also acknowledging the complexities and historical nuances that surround the understanding of this verse.

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References

Al-ʿArūsī al-Ḥuwayzī, ʿAbd ʿAli ibn Jumʿah (1994). *Nūr al-Thaqalayn*. Qom: Ismāʿīlīyān.

Al-Bultaji, A. M. (2006). The Miracle of the Revelation of Iron and Its Severe Power in the Holy Qur'an and Astronomical and Nuclear Physics (in Arabic). *The Eighth International Conference on Scientific Miracles in the Qur'an and Sunnah*. Kuwait.

Al-Farāhīdī, al-Khalīl ibn Aḥmad (1988). *Kitāb al-ʿAyn*. Qom: Hejrat.

Al-Hajj, A.Y. (2003). *Encyclopedia of Scientific Miracles of the Qur'an and Sunnah* (in Arabic). Damascus: Maktabah Ibn Ḥajar.

Al-Jawharī, Ismāʿīl ibn Ḥammād (1990). *al-Ṣiḥāḥ: Tāj al-Lughah wa Ṣiḥāḥ al-ʿArabīyah*. Beirut: Dār al-ʿIlm lil-Malāyīn.

Al-Mazhari, M.S. (1991). *Al-Tafsīr al-Maẓharī*. Pakistan: Maktabah al-Rushdīyah.

Al-Mustafawi, Hassan (1989). *al-Taḥqīq fī Kalimāt al-Qur'ān al-Karīm*. Tehran: Ministry of Culture and Islamic Guidance.

Al-Rāghib al-Iṣfahānī, Ḥusayn ibn Muḥammad (1991). Mufradāt Alfāẓ al-Qur'ān. Beirut: Dār al-Qalam.

Al-Rāzī, Fakhr al-Dīn Muḥammad (1999). *Mafātīḥ al-Ghayb*. Beirut: Dār al-Iḥyā' al-Turāth al-ʿArabī.

Al-Ṭabrisī, Faḍl ibn Ḥasan (1993). *Majmaʿ al-Bayān fī Tafsīr al-Qur'ān*. Tehran: Nasir Khosro.

Al-Ṭurayḥī, Fakhr al-Dīn (1996). *Majmaʿ al-Baḥrayn*. Tehran: Mortazavi.

Al-Ubaydi, K. F. (2005). *Tafṣīl al-Nuḥās wa al-Ḥadīd fī Kitāb al-Majīd*. Beirut: Dār al-Kutub al-ʿIlmīyyah.

Al-Zabīdī, Muḥammad (1993). *Tāj Al-ʿArūs min Jawāhir al-Qāmūs*. Beirut: Dār al-Fikr.

Al-Zamakhsharī, Maḥmūd ibn ʿUmar (1986). *al-Kashshāfʿan Ḥaqā'iq Ghawāmiḍ al-Tanzīl*. Beirut: Dār al-Kitāb al-ʿArabī.

Ball, P. (2004). *The elements: A very short introduction*. Oxford University Press.

Barati, G., & Paymard, F. (2022). Scientific Explanation of Hail Based on the Verse 43 of Surah al-Nūr from the Noble Qur'an. *Journal of Interdisciplinary Qur'anic Studies, 1*(1), 23-41. https://doi.org/10.37264/JIQS.V1I1.2

Bennett, N.R., Sio, C.K., Schauble, E., Lesher C.E., Wimpenny, J. & Shahar, A. (2022). Iron isotope evidence of an impact origin for main-group pallasites. *Geochemical perspectives letters*. https://doi.org/10.7185/geochemlet.2229

Besharati, M., & Besharati, Z. (2022). Reinterpretation of "the Darkness of the Three" in Verse 6 of Surah al-Zumar, in Light of the Components of the Scientific Miracle of the Qur'an. *Journal of Interdisciplinary Qur'anic Studies, 1*(1), 83-105. https://doi.org/10.37264/jiqs.v1i1.6

Bjorkman J. K. (1973). Meteors and meteorites in the ancient near east. *Meteoritics & Planetary Science*, 8, 91–132.

Boroujerdi, M.I. (1987). *Tafsīr Jāmiʿ*. Tehran: Sadr

Burbidge, M., Burbidge, G., Fowler W. A., and Hoyle, F. (1957). Synthesis of the Elements in Stars. *Rev. Mod. Phys.* 29, 547.

Cox, B. & Cohen, A. (2011). *Wonders of the Universe*. United Kingdom: HarperCollins Publishers.

Elardo S.M. & Shahar, A. (2017). Non-chondritic iron isotope ratios in planetary mantles as a result of core formation. *Nature Geoscience*, 10(4), 317-321. https://doi.org/10.1038/NGEO2896

Fadlallah, M.H. (1998). *Min Waḥy Al-Qur'ān*. Beirut: Dār al-Malāk

Gardner, A. (1957). *Egyptian Grammar*. Oxford University Press.

Ghernaout, D. (2017).The Holy Koran Revelation: Iron Is a "Sent Down" Metal. *American Journal of Environmental Protection*, 6(4), 101-104. https://doi.org/10.11648/j.ajep.20170604.14

Harris, J. R. (1961). *Lexicographical Studies in Ancient Egyptian Minerals*. Berlin: Akademieverlag.

Husseini Hamedani, M.H. (1983). *Anwār Dirakhshān*. Tehran: Lotfi.

Ibn ʿĀshūr, Muḥammad ibn al-Ṭāhir (1999). *al-Taḥrīr wa al-Tanwīr*. Beirut: al-Tārīkh al-ʿArabī.

Ibn Durayd, Muḥammad ibn Ḥasan (1986). *Jamharah al-Lughah*. Beirut: Dār al-ʿilm lil-malāyīn.

Ibn Fāris, Aḥmad (1979). *Muʿjam al-Maqāyīs fī al-Lughah*. Beirut: Dār al-Fikr.

Ibn Manẓūr, Muḥammad ibn Mukarram (1993). *Lisān al-ʿArab*. Beirut: Dār al-Fikr/Dār Ṣādir.

Jafari, M. (2023). Study on Possibility of Miracle in the Qur'an Verses 55:19-22: How Qur'an Has Revealed the Formation Process of Pearls and Coral from River to Sea. *Journal of Interdisciplinary Qur'anic Studies, 2*(1). https://doi.org/10.37264/jiqs.v2i1june2023.5

Koutb, M. (2022). Water Breakdown during Photosynthesis and Transpiration in

Plants as a Scientific Miracle in the Qur'an. *Journal of Interdisciplinary Qur'anic Studies, 1*(2). http://dx.doi.org/10.37264/jiqs.v1i2.9

Kraus, R., Root, S., Lemke, R. et al. (2015). Impact vaporization of planetesimal cores in the late stages of planet formation. *Nature Geosci*, 8, 269–272. https://doi.org/10.1038/ngeo2369

laPaz, L. (1969). *Topics in Meteoritics: Hunting Meteorites: Their Recovery, Use and Abuse from Paleolithic to Present*. University of New Mexico, Albuquerque.

Liu, J., Dauphas, N., Roskosz, M. et al. (2017). Iron isotopic fractionation between silicate mantle and metallic core at high pressure. *Nat Commun*, 8, 14377. https://doi.org/10.1038/ncomms14377

Makarem Shirazi, N. (2001). *Tafsīr Nimūnah*. Tehran: Dār al-Kutub al-Islāmīyyah.

Marchant, J. (2013). Iron in Egyptian relics came from space. *Nature*. https://doi.org/10.1038/nature.2013.13091

Maxwell-Hyslop R. (1972). The metals Amutu and Asiu in the Kultepe Texts may also mean iron. *Anatolian Studies*, 22, 159–162.

Mazaheri Tehrani, B., Mosalla'ipour, A., & Rohani Mashhadi, F. (2016). Introduction to Theological Principles of Scientific Interpretation of the Holy Qur'an. *Mirror of Wisdom*, 16(3), 75-100.

Miri, S. S. & Akbari, Z. (2014). Zolqarnein's Dam Construction. *Journal of the Holy Qur'an and Islamic text*, 5(18), 25-36.

Modarresi, M. T. (1998). *Min Hudā al-Qur'ān*. Tehran: Dār Muḥibī al-Ḥusayn.

Moghaddasi, A. (2022). Why the Dhul-Qarnayn's dam is impenetrable? A Chemical and physical study. *Journal of Interdisciplinary Qur'anic Studies*, 1(1), 71-82. https://doi.org/10.37264/jiqs.v1i1.5

Moradi, M. (2022). The Scientific Explanation of *Ṣayḥah* as a Divine Punishment of Some Ancient Tribes Mentioned in the Qur'an. *Journal of Interdisciplinary Qur'anic Studies, 1*(2). http://dx.doi.org/10.37264/jiqs.v1i2.2

Nasiri Gheydari, S. (2022). Spectrum of the Existence's Consciousness. *Journal of Interdisciplinary Qur'anic Studies*, *1*(2). http://dx.doi.org/10.37264/jiqs.v1i2.1

Nejati, S. (2019). Reappraisal of the Qur'anic Concept of 'Might' in Iron Based on the Findings of Nuclear Physics. *The Qur'an and Science*, 13(24), 145-166. https://doi.org/10.22034/qve.2019.2756

Pechersky, D.M., Kuzina, D.M., Markov, G.P. et al. (2017). Native iron in the Earth and space. *Izv. Phys. Solid Earth*, 53, 658–676. https://doi.org/10.1134/S1069351317030089

Qarai, Ali Quli .(٢٠٠٤) *Translation of the Holy Qur'an* .London: ICAS.

Qorashi, A.A. (1998). *Qāmūs Qur'ān*. Tehran: Biʿthat.

Quṭb, Sayyid (1991). *Fī Ẓilāl al-Qur'ān*. Cairo: Dār al-Shurūq.

Rehren, T. et al. (2013). 5,000 years old Egyptian iron beads made from hammered meteoritic iron. Journal of Archaeological Science, 40(12), 4785-4792. https://doi.org/10.1016/j.jas.2013.06.002

Reza'i Isfahani, M. A. (2013). *ʿUlūm Qur'ānī 2*. Qom: al-Muṣṭafā.

Sabzevari Najafi, M. (1988). *Irshād al-Adhhān ilā Tafsīr al-Qur'ān*. Beirut: Dār al-ta'arif

Sadeqi Tehrani, M. (1986). *al-Furqān fī Tafsīr al-Qur'ān bil-Qur'ān*. Qom: Farhange Islami.

Saqafi Tehrani, M. (1977). *Rawān Jāwīd*. Tehran: Borhan

Scott, E. (2020). Iron Meteorites: Composition, Age, and Origin. Oxford Research Encyclopedia of Planetary Science. https://doi.org/10.1093/acrefore/9780190647926.013.206

Shojaie, H., & Mazaheri Tehrani, B. (2022). Formation of the Universe from the Viewpoint of the Quran and Science. *Journal of Interdisciplinary Qur'anic Studies*, *1*(1), 43-56. https://doi.org/10.37264/jiqs.v1i1.3

Tabataba'i, M. H. (1996). *al-Mīzān fī Tafsīr al-Qur'ān*. Qom: Jāmiʿah Mudarrisīn.

Talebpour, A., Rohani Mashhadi, F., & Moradi, M. (2022). Introducing an Original Method in Evaluating the Scientific Miracle of the Qur'an. *Journal of Interdisciplinary Qur'anic Studies*, *1*(1), 5-21. https://doi.org/10.37264/jiqs.v1i1.1

Tantawi Jawhari. (2004). *al-Jawāhir fī Tafsīr al-Qur'ān al-Karīm*. Beirut: Dār al-Kutub al-ʿIlmīyyah.

Tantawi, M. S. (1985). *al-Tafsīr al-Wasīṭ lil-Qur'ān al-Karīm*. Cairo: Nahḍah Miṣr.

Wood. B. (2011). The formation and differentiation of Earth. *Physics Today*, 64(12), 40-45. https://doi.org/10.1063/PT.3.1362

Woosley, S., & Janka, T. (2005). The physics of core-collapse supernovae. *Nature Physics*, 1(3), 147-154.

Yimer, A. M. (2015). Review on Marvelous Incidence of the Iron Observable in Livelihood and its History. *Natural Products Chemistry & Research*, 3(5). http://dx.doi.org/10.4172/2329-6836.1000185

Zare, F., Jaladat, A. M., & Baghbani, M. (2023). Being Awake at Dawn: A Religious Austerity or a Hygienic Recommendation (A Scrutiny Based on the Holy Qur'an, Traditional Persian Medicine and Modern Medicine). *Journal of Interdisciplinary Qur'anic Studies*, *2*(1), 227-242. https://doi.org/10.37264/jiqs.v2i1june2023.12