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Semantic and Scientific Interpretation of Al-Ẓill (Shadow) in the Qur'an: A Semantic-Based Tafsīr 'Ilmī of Surah al-Furqān (25:45–46) in Light of Geometric Optics

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Abstract: Shadows as observable natural phenomena are described in the Qur'an, particularly in Surah al-Furqān (25:45–46), which portrays their extension, movement, and relation to the sun. This study aims to analyze the concept of *al-ẓill* (shadow) in these verses through a semantic-based approach to *tafsīr 'ilmī* and to examine its conceptual correlation with principles of geometric optics. The research employs a qualitative textual method using a three-layered analytical framework consisting of semantic deconstruction, exegetical mapping, and conceptual correlation. The first stage analyzes key Qur'anic terms—*madda*, *ẓill*, *dalīlan*, and *qabḍnāhu*—through classical Arabic lexicons and semantic field analysis. The second stage examines interpretations from classical and modern exegetical works to trace the historical understanding of the verses. The third stage explores the conceptual alignment between the Qur'anic description of shadows and established principles of geometric optics concerning shadow formation and solar geometry. The findings indicate that the Qur'an describes shadows as dynamic and orderly phenomena governed by the position of the sun, reflecting a coherent observational pattern compatible with scientific explanations of shadow formation and variation. Rather than presenting scientific predictions, the Qur'anic narrative offers a phenomenological description of natural processes that invites reflection on cosmic order and divine wisdom. This study contributes a methodological model for interdisciplinary research that integrates semantic analysis of Qur'anic language with responsible engagement with scientific knowledge

Keywords: *Semantic Analysis; Tafsīr 'Ilmī; Al-Ẓill; Qur'anic Exegesis; Geometric Optics; Surah al-Furqān*

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Introduction

The Islamic intellectual tradition is distinguished by its profound integration of empirical inquiry and spiritual pursuit, a synthesis clearly embedded within the Qur'anic text itself. Scholarly analysis, exemplified by the work of Zaghlul al-Najjar, identifies approximately one thousand verses that engage directly with natural phenomena, while the concept of knowledge *('ilm)* and its cognates are recurrent, appearing over 770 times.[1]

[1] Umaiyatus Syarifah and Siti Fahimah, "Zaghlûl Râghib Muhammad Al-Najjâr's Methods and Principles of Scientific Exegesis: A Review of Tafsîr al-Âyât al-Kawniyyah Fî al-Qur'ân al-Karîm," *Ulul Albab: Jurnal Studi Islam* 21, no. 2 (2020): 289–311.

This textual emphasis translates into practical necessity, as the precise fulfillment of core Islamic rituals from the daily prayer schedule to the determination of sacred months and the Hajj pilgrimage is fundamentally dependent on sophisticated astronomical and scientific calculation. This intrinsic harmony stands in direct opposition to the epistemological dichotomy that has historically characterized much of Western thought, where science and religion are often framed as conflicting or incompatible domains.[2] In contrast, the Islamic paradigm posits a complementary and mutually enriching relationship between revelation and reason, offering a coherent framework that bridges the sacred and the empirical. [3]

Since the scientific revolution, modern physics has achieved remarkable success in explaining natural phenomena through mathematical formulations and empirical verification. This success has enabled humans to predict, control, and manipulate nature with a high degree of precision, thus becoming the main foundation for the development of modern technology.[4] However, this epistemological orientation has also given rise to a dichotomy between the physical world, which is treated as objective, measurable, and value-free, and the spiritual dimension, which is often considered subjective and excluded from scientific discourse. This separation contrasts sharply with the Islamic worldview based on the principle of *tawḥīd*, which views the universe as a coherent and meaningful system of divine signs subject to the laws of Allah *(sunnatullāh*), where empirical reality and metaphysical meaning are inseparable.[5]

In the Islamic intellectual tradition, natural phenomena are not understood merely as material events, but as manifestations of divine order and wisdom. Classical Muslim scientists such as Ibn al-Haytham viewed scientific inquiry as both an intellectual endeavor and a spiritual reflection to uncover the harmony embedded in Allah's creation. [6] Thus, scientific activity is not separate from faith, but rather reinforces it. One everyday phenomenon that reflects this integrative perspective is the phenomenon of shadows. In

[2] Neneng Munajah, "The Concept of Integration of Science and Religion," *Al-Risalah* 13, no. 1 (2020): 108–17, https://doi.org/10.34005/alrisalah.v13i1.1728.

[3] Abdullah Amin, *Multidisiplin, Interdisiplin Dan Transdisiplin, Metode Sudi Agama& Studi Islam Di Era Kontemporer* (Yogyayakrta: IB Pustaka, 2020).

[4] Aldy Pradhana and Yongki Sutoyo, "Worldview Islam Sebagai Basis Pengembangan Ilmu Fisika," *Tsaqafah* 15, no. 2 (2019): 187, https://doi.org/10.21111/tsaqafah.v15i2.3387.

[5] Mohammed Ajmal Al-Aidrus, "Osman Bakar Tawhid And Science: Islamic Perspectives On Religion And Science," KATHA Journal of Dialogue of Civilization, 2008: 127.

[6] Seyyed Hossein Nasr, Science and Civilization in Islam (Harvard University Press, 1968), 129-130.

modern optics, shadows are explained as the result of light obstruction, determined by the relative position of the light source, the object, and the receiving surface.[7]

Surah Al-Furqān (25:45–46) is one of the most explicit discussions in the Qur'an regarding the phenomenon of shadows, explicitly stating that it is Allah who lengthens and shortens shadows and makes the sun a *dalīl* (sign). Ali Sābūnī emphasized that the continuous change in shadows follows the position and movement of the sun, reflecting a precise and orderly cosmic system.[8] They interpret these verses as an invitation not only to visual observation *(ru'yah al-'ayn)*, but also to intellectual contemplation *(ru'yah al-'ilm)*.[9] This approach shows that the Qur'an encourages a form of rational reflection that is in line with the basic methodologies of scientific inquiry, such as observation, pattern recognition, and understanding of cause and effect.

Contemporary scholarship acknowledges points of convergence between Qur'anic descriptions of natural phenomena and modern scientific understanding. Notably, commentators like Maurice Bucaille have observed that the Qur'an avoids pre-modern cosmological assumptions, such as shadows being inherent properties of objects, and instead implicitly positions the sun as the primary regulator of shadow direction and length.[10] This perspective finds a conceptual parallel in geometric optics, which explains shadow dynamics through the angle of illumination and the relative positions of light source, object, and plane.[11]

However, a review of the literature reveals that existing research operates within isolated disciplinary silos, creating a fragmented understanding. Studies either; Focus on practical astronomical measurement (e.g., Amelia et al., 2023, on shadowless days for prayer timing) without engaging the Qur'anic text's semantic or exegetical layers. Conduct purely linguistic or thematic analysis of the term *ẓill* (e.g., Javanrudi & Rostami, 2023; Al-Zaidi, 2022; Mukhlaf, 2023), detailing its rich theological and symbolic meanings but deliberately stopping short of scientific correlation; Or examine shadows

[7] Ibn Al-Haytham, Al-Manāẓir (Kuwait: al-Silsilah al-Turāthiyyah, 1983), 72-73.

[8] Syekh Muhammad Ali Sābūnī, Ṣafwatut Al-Tafāsīr, vol. 2 (Beirut: Dar Qur`anul karim, 1981), 365.

[9] Abu Bakar Muhammad bin Zakariya Al-Razi, Mafaṭīḥ Al-Ghayb, vol, 24 (Lebanon: Dār al-Fikr, 1981), 89.

[10] Maurice Bucaille, *Al-Tawrāh Wa Al-Injīl Wa Al-Qur'ān Al-'Ilm*, Tarjamah: (Beirut: Al-Maktabah al-'Ilmiyyah, 1441). 221

[11] Maurice Bucaille, *La Bible Le Coran et La Science, Terj. M. Rasyidi* (Jakarta: Bulan Bintang, 2007). 121

from a secular, applied-science perspective (e.g., Fredyanoni et al., 2024, in architecture) with no connection to scriptural hermeneutics. Consequently, a significant methodological gap persists: a lack of a structured, text-first framework that systematically integrates deep semantic analysis, historical exegesis, and established scientific principles into a single, coherent study. Prior approaches risk either remaining disconnected from natural science or applying scientific explanations in an *ad hoc* or apologetic manner.

To address this gap, this study proposes a novel three-layered integrative framework: First, A systematic examination of the key terms (*madda*, *ẓill*, *dalīlan*, *qabḍnāhu*) using primary classical Arabic lexicons (e.g., *Lisān al-'Arab*, *al-Muʿjam al-Wasīṭ*) and their synchronic and diachronic usage across the Qur'anic corpus to establish their precise semantic field. *Second*, Analyzing the interpretations of selected classical and modern exegetes (such as al-Ṭabarī, al-Rāzī, Ibn Kathīr, and al-Ṭanṭāwī) to trace the historical construction of the verses' theological and naturalistic understandings. Third, Contextualizing the resultant conceptual model against the well-established principles of geometric optics concerning shadow formation and solar geometry. This step is strictly limited to demonstrating conceptual coherence not proof of scientific foreknowledge and relies on standard academic references in physics and astronomy. Through this method, this study aims to move beyond parallel, disconnected discussions and provide a testable and replicable model for interdisciplinary *tafsīr 'ilmī*. This enriches both the engagement with scripture and the appreciation of its integrative worldview toward natural phenomena.

This study proposes and applies an integrative three-layered methodological framework designed to address the primary criticisms of conventional *tafsīr 'ilmī,* namely, its tendency toward *eisegesis* (importing external meanings into the text) and an apologetic approach that often overlooks linguistic depth and classical exegetical heritage. This structured protocol ensures that a scientific reading of the Qur'an's cosmological verses remains firmly rooted in the text's own foundation while enabling a productive dialogue with contemporary scientific knowledge. The framework is sequential and cumulative, consisting of Semantic Deconstruction, Exegetical Mapping, and Conceptual Correlation**.**

The first, the foundational layer is Semantic Deconstruction **(***al-Taḥlīl al-Dalālī***)**. Before any scientific interpretation is engaged, a thorough dissection of the key terms within the verse is conducted.[12] This involves a rigorous etymological-lexicographic analysis, tracing the root (*jazr*) and the evolution of meaning in classical and medieval Arabic dictionaries such as *Lisān al-ʿArab* and *al-Muʿjam al-Wasīṭ*. Furthermore, it maps the semantic field (*Ḥaql al-Dalālah*) of each term, identifying its spectrum of concrete and abstract meanings and its relationships of antonymy and synonymy. Finally, a distributional analysis (*al-Taḥlīl al-Tawzīʿī*) examines the word's usage across the entire Qur'anic corpus to understand the nuances it acquires in different contexts. This layer establishes the precise conceptual building blocks provided by the Qur'an's own language.

The second, Exegetical Mapping **(***al-Taqyīd al-Tafsīrī***)**, traces how these semantically clarified terms have been interpreted, developed, and sometimes debated throughout the history of Islamic exegesis.[13] It synthesizes thematic explanations from classical (e.g., al-Ṭabarī, al-Rāzī), medieval (e.g., Ibn Kathīr, al-Qurṭubī), and contemporary (e.g., al-Ṭanṭāwī, Quraish Shihab) commentators. This process contextualizes interpretations within the historical-epistemological framework of the natural knowledge (*cosmology*) available to each exegete, identifying continuities and discontinuities in interpretive emphasis that reveal constant or evolving dimensions of meaning.

The third, Conceptual Correlation **(***al-Tanāṣur al-Mafāhīmī***)**, proceeds. This stage seeks points of convergence between the conceptually understood Qur'anic description and modern scientific principles that explain the same phenomenon. It is strictly an exercise in conceptual alignment**,** demonstrating a harmony (*munāsabah mafhūmiyyah*) between, for instance, the Qur'an's phenomenological description of an orderly process and the observed constancy of natural law. It unequivocally distinguishes this from claims of technical-quantitative correspondence. This layer emphasizes that while science explains the "how," the Qur'an often directs the reader to the "why" or "for what purpose," framing the phenomenon as an *āyah* (sign) inviting theological and spiritual reflection.

[12] G. Stanghellini, "A Case Study in Semantic Deconstruction," *Journal of Psychopathology* 22, no. 1 (2016): 79–87.

[13] A. N. Andri Nirwana et al., "Mapping Quranic Exegesis Research: Trends, Contributions, and Future Directions," *Jurnal Ilmiah Peuradeun* 13, no. 1 (2025): 319–50, https://doi.org/10.26811/peuradeun.v13i1.1250.

Discussion

Semantic Analysis of Key Terms

Applying the first layer of this framework to QS al-Furqān 25:45–46 yields a precise semantic map of its four key terms, as synthesized below. This analysis moves beyond simple definition to capture the core lexical meaning, its attestation in primary lexicographic sources, its range of usage in the Qur'an, and the specific nuanced meaning it carries within the immediate verse context. The semantic core of QS al-Furqān 25:45–46 is constructed through four precise Arabic terms, each carrying a distinct conceptual load that forms a coherent narrative of observed natural phenomena.

1) Madda: Conceptualizing Gradual Process

The first term, *madda* (root: *m-d-d*), lexically denotes a gradual, continuous extension or stretching, not a sudden or disjointed motion. Classical lexicons like *Lisān al-'Arab* define it as "stretching and extending" and explicitly position it as the opposite of *qabḍ* (contraction).[14] Within the Qur'anic corpus, this root conveys meanings of physical/spatial extension, the provision of sustenance, and the prolongation of time.[15] In the specific context of verse 45, *madda* captures the phenomenological process of a shadow lengthening in a slow, regular, and observable manner.[16] This structured opposition (*madda-qabḍ*) reflects a Qur'anic pattern of describing natural phenomena through balanced, measurable processes a concept directly correlative with the geometric optics principle of shadow-length variation as a function of solar angle. Theologically, its use in the interrogative phrase *kaifa madda* (how He extends) frames this process not as a blind mechanical event but as a deliberate, sustained divine action, emphasizing continuous creation (*khalq mustamirr*) and a structured cosmic order.[17]

2) Ẓill: A Multi-Layered Sign

The second key term is *ẓill* (root: *ẓ-l-l*), which fundamentally means shade or protection from direct sunlight, distinctly different from total darkness (*ẓulmah*).[18] Lexicographers like al-Jurjānī specify it as the protection from the sun from sunrise until

[14] Ibn Manẓūr, *Lisān Al-'Arab, vol 3* (Beirut: Dar Shadir, 1990), 396.
[15] Raghib Ashfahani, *Mufradāt Fii Gharib Al-Qur'ān* (Damascus: Dar Qalam, 1412), 763.
[16] Muhammad Ratib An-Nabulsy, *Tafsir Al-Nabulsy, vol. 2* (Oman: Muassasah Al Furasan, 2017), 687-688.
[17] Al-Alusi, *Ruh Al-Ma'ani, vol. 10* (Libanon: Dar al-Kutub al-'Ilmiyah, 1994), 27.
[18] Ibn Manẓūr, *Lisān Al-'Arab, vol 11* (Beirut: Dar Shadir, 1990), 410-411.

its zenith.[19] In the Qur'an, *ẓill* appears in contexts ranging from physical shade and divine protection to a metaphor for transience and even as an ironic descriptor of hell's smoke.[20] In verses 45–46, *ẓill* functions as the direct object of the divine verbs it is the entity that is extended and contracted. Phenomenologically, classified by classical scholars (e.g., Abū al-Haytsam) into *Ẓill* (morning to zenith) and *fay'* (afternoon), demonstrating precise phenomenological observation tied to solar cycles, it refers accurately to the zone of reduced light intensity behind an illuminated object.[21] Theologically, its selection is significant; as a phenomenon associated with comfort and blessing in human experience, its subjection to orderly divine manipulation transforms it into a tangible sign (*āyah*), demonstrating that even mundane, beneficial aspects of creation are direct proofs of Allah's power and regulation. This multi-layered signification exemplifies how Qur'anic terminology operates within an integrated cosmology, where natural phenomena are never merely physical but always point beyond themselves.

3) Dalīlan: The Epistemological Function

The third pivotal term is *dalīlan* (root: *d-l-l*), an intensive noun form meaning a clear guide, indicator, or evidential proof. The root conveys the core idea of leading to knowledge, as noted in *Mufradāt Fii Gharib Al-Qur'ān,*.[22] Qur'anically, derivatives of this root are used for physical guides, evidence for reflection, and spiritual guidance. In verse 45, the sun is appointed as a *dalīl* for the shadow. This moves beyond a simple statement of causal relationship to an epistemological claim: the sun is the manifest reference point that makes the shadow's existence, behavior, and change comprehensible and measurable.[23] It establishes a structured, knowable relationship between celestial body and terrestrial phenomenon, presenting the universe as a coherent system filled with intelligible signs (*dalā'il*) that invite rational contemplation and lead to recognition of divine wisdom. This reflects a Qur'anic epistemology of nature, where physical phenomena are structured to facilitate human understanding and reflection.

[19] Alī ibn Muḥammad ibn 'Alī al-Zayn Al-Sharīf Al-Jurjānī, *Al-Ta'Rīfāt* (Beirut: Dār al-Kutub al-'Ilmiyyah, 1983), 186.

[20] Mutawallī Asy-Sya'rāwī, *Tafsīr Asy-Sya'rāwī* (Kairo: Akhbarul Yaum, 1991), 10457.

[21] Abu Hayyan al-Andalusi, *Bahr Al-Muhith, vol 8* (Beirut: Dār al-Fikr, 1413), 112.

[22] Raghib Ashfahani, *Mufradāt Fii Gharib Al-Qur'ān, (*Damascus: Dar Qalam, 1412), 312.

[23] Yahyaa Waziirii, *I'jaaz Wasf Azh-Zhill Wa Azh-Zhilaal Fii Al-Qur'aan Al-Kariim*, 2019, http://m-quran.com.

4) Qabḍnāhu: Completion of the Dynamic Cycle

The final term, *qabḍnāhu* (root: *q-b-ḍ*), signifies grasping, seizing, withdrawing, or contracting.[24] It is classically defined as the opposite of expansion *(basṭ)* and is often used in the Qur'an in contexts of taking souls, exerting divine power, and constriction.[25] In verse 46, it describes the phase where the extended shadow is gradually withdrawn.[26] The choice of *qabḍ,* rather than a simpler word for shortening, imports a sense of deliberate, controlled retrieval by a sovereign agent. The attached adverb *yasīran* (gently, with ease) further characterizes this retrieval as a measured and benign process. Theologically, the phrase *qabaḍnāhu ilaynā* (We withdraw it to Us) is profound, asserting that the entire cycle of extension and contraction originates from and culminates in Allah, emphasizing both the transience of created phenomena and the absolute, encompassing sovereignty of the Creator.[27] Together, these four terms *madda, ẓill, dalīlan*, and *qabḍ* form a semantically integrated and theologically charged description of a natural cycle, providing a robust linguistic foundation for any subsequent exegetical or scientific exploration.

A deep etymological-lexical excavation reveals the profound semantic precision of these terms. The root *m-d-d* carries connotations of both spatial extension and temporal duration, captured in words like madd (wave) and muddat (time period). This makes madda the perfect descriptor for a shadow's gradual, continuous lengthening—a process, not an instant event. The term ẓill evolves from a concrete sensory experience (pleasant relief from heat) to an abstract symbol of protection. The Qur'an retains its phenomenological accuracy while dynamizing it: here, *ẓill* is not a static state but an entity undergoing action, aligning with the Islamic worldview of a perpetually engaged creation (*musakhkhar*). The choice of the intensive form *dalīlan* is critical; it means "a most evident guide," transforming the sun from a mere physical cause into the primary epistemic key for understanding the shadow. This constructs a natural epistemology where the universe is replete with clear "signs" (*dalāʾil*) leading to knowledge of the Creator. Finally, qabḍ forms a perfect semantic antithesis (*ṭibāq*) to madda. Its Qur'anic

[24] Ibnu Faris, *Maqāyīs Al-Lughah, vol 5,* (Beirut: Dar Fikr, 1969), 50.

[25] Abū Al-Suʿūd, *Irshād Al-ʿAql Al-Salīm Ilā Mazāyā Al-Kitāb Al-Karīm, vol. 6* (Beirut: Dār Iḥyāʾ al-Turāth al-ʿArabī, 1998), 223.

[26] Syahatah, *Āyāt Allāh Fī Al-Kawn* (Mesir: Dar Nahdhotul Misr, 2004), 222.

[27] Zaghlur An-Najjar, *Tafsīr Al-Āyāt Al-Kawniyyah Fī Al-Qur'ān Al-Karīm, vol 2* (Kairo: Maktabah al-Shurūq al-Dawlah, 2010), 330.

association with powerful, definitive divine acts (like taking souls) lends the phrase *qabaḍnāhu ilaynā* a profound resonance: it marks the completion of a daily cycle, affirms that all processes begin and end with Allah, and subtly echoes the ultimate "taking back" of all creation.

In conclusion, this first layer of semantic deconstruction proves that the four key terms in QS 25:45–46 are not arbitrary choices. They form an interlinked conceptual narrative: an entity (ẓill) undergoes a deliberate, gradual extension (madda) under the guidance of a clear indicator (dalīl), before being retrieved (qabḍ) in a controlled manner. This semantic foundation establishes a clear "map of meaning" that will guide and delimit all subsequent interpretive and correlative steps. It ensures that the ensuing tafsīr 'ilmī remains anchored to the linguistic message of the text itself, allowing for a dialogue with science that is disciplined by the Qur'an's own conceptual framework.

Semantic-Based Tafsīr 'Ilmī: Contextual Analysis of the Verses

Having established the precise semantic architecture of its key terms, we now apply this foundation to a sequential, contextual exegesis of QS al-Furqān 25:45–46. This analysis moves from the isolated deconstruction of words to their integrated performance within the verse's narrative flow, directly building interpretation upon the established semantic matrix and explicitly exploring its correlation with geometric optics.

1) Section 1: "*Alam tara ilā rabbika kayfa madda al-ẓill*" (Have you not considered your Lord – how He extends the shadow?)

This opening is a directive for deep, cognitive observation. The verb *ra'ā* (to see) is interpreted by classical exegetes like Razi as an invitation to intellectual vision (*ru'yat al-baṣīrah*), a reflective observation beyond mere sight.[28] The object of contemplation is the modality *(kayfa)* of the divine act of *madda* upon the *ẓill*. Drawing from the semantic matrix, *madda* signifies a gradual, continuous extension, and *ẓill* is the physical, comfortable shade. Thus, the verse literally directs attention to the observable process where a shadow lengthens incrementally a phenomenon best witnessed from sunrise towards midday (as the shadow shrinks from an infinite dawn length) or from midday to sunset.[29]

[28] Al-Razi, *Mafaṭīḥ Al-Ghayb,* vol. 24, (Lebanon: Dār al-Fikr, 1981), 88.

[29] An-Nabulsy, *Tafsir Al-Nabulsy,* Muhammad Ratib An-Nabulsy, *Tafsir Al-Nabulsy*, vol. 2, (Oman: Muassasah Al Furasan, 2017). 683.

This description shows strong conceptual alignmentwith the principle in geometric optics where shadow length (L) on a flat surface is a function of the object height (h) and the solar altitude angle (α): L = h / tan(α). As the sun approaches the horizon (α → 0°), tan(α) decreases, causing L to increase dramatically and continuously. The core semantic feature of *madda* gradual, continuous change over time is precisely the mathematical reality described by the derivative dL/dt, which is finite and non-instantaneous. The verse, therefore, captures the essential phenomenological and mathematical nature of the process: a smooth, regular elongation.

2) Section 2: "*Wa law shā'a laja'alahū sākinan*" (And if He had willed, He could have made it stationary.)

This conditional clause is a critical theological interjection. It interrupts the description of motion to assert the contingency of natural law. *Sākinan* (stationary) is posited as the direct semantic and physical opposite of *madda*.[30] Al-Rāzī explains that this would mean a shadow fixed in length and position, a scenario conceivable if the relative motion between the light source and the object ceased. [31]

From an optical perspective, a stationary shadow (*ẓill sākin*) implies a constant solar altitude angle. This could occur in two hypothetical scenarios: 1) A geostatic model with a non-rotating Earth and a sun fixed at one azimuth and altitude (contrary to reality), or 2) A location at a planetary pole during a solstice, where the sun's apparent diurnal motion is nearly parallel to the horizon, producing minimal shadow change.[32] The verse uses this counterfactual not to describe an actual cosmology but to divorce the observed regularity from necessity. It frames the consistent relationship between sun and shadow, which optics formalizes as a deterministic geometric law as a product of deliberate, sustained divine will *(mashee'ah).* The semantic opposition between *madda* (dynamic, contingent process) and *sākinan* (static, hypothetical state) thereby reinforces a theology of continuous creation and voluntary natural order.

3) Section 3: "*Thumma ja'alnā al-shamsa 'alayhi dalīlan*" (Then We made the sun an indicator/guide for it.)

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[30] Al-Suʿūd, *Irshād Al-ʿAql Al-Salīm Ilā Mazāyā Al-Kitāb Al-Karīm,* vol. 6 (Beirut: Dār Iḥyāʾ al-Turāth al-ʿArabī, 1998), 222..

[31] Al-Razi, *Mafaṭīḥ Al-Ghayb,* vol. 24, (Lebanon: Dār al-Fikr, 1981), 89.

[32] Yahyaa Waziirii, "Al-Ẓill as-Sākin," in *Ilm Al-Falak Wa Al-Faḍā'* (Markaz 'Ālamī Mutakhaṣṣaṣ fī Abḥāth al-I'jāz al-'Ilmī fī al-Qur'ān al-Karīm wa as-Sunnah an-Nabawiyyah al-Muṭahharah, 2025), https://eajazcenter.com/.

The conjunction *thumma* (then) signifies a logical or consequential sequence. Having presented the phenomenon and its contingent nature, the verse now reveals its epistemic key. As per our semantic analysis, *dalīlan* is an intensive form meaning "a clear guide or evidence." The sun is appointed as the dalīl for the shadow.[33] Classical exegetes like al-Qurṭubī emphasize the relational necessity this establishes: the shadow is known only through the sun. This is not merely a causal statement but an epistemological one. The shadow's properties, its very existence, direction, length, and movement are functions of the sun's position. The sun is the independent variable, the shadow the dependent variable.[34]

This is a clear conceptual correspondence for geometric optics. In optical science, the light source is the primary reference for analyzing any shadow. The direction of a shadow is determined by the vector from the object to the light source. Its length is determined by the angle of incidence. Its very existence is defined by the occlusion of rays from that source. The sun, therefore, is indeed the perfect natural *dalīl.* The intensive form *dalīlan* underscores its role as the unequivocal, dominant parameter. This semantic choice mirrors the scientific practice of using the sun's position (altitude and azimuth) as the fundamental input for calculating shadow parameters in fields like astronomy, gnomonics (sundial design), and architecture. The verse thus identifies the correct governing relationship within the phenomenon.

4) Section 4: "*Thumma qabaḍnāhu ilaynā qabḍan yasīran*" (Then We withdraw it to Us, a gradual withdrawal.)

The final clause, again introduced by thumma, completes the cycle initiated by *madda.* The semantic matrix defines *qabḍ* as a controlled drawing-in or retrieval, often with connotations of sovereign authority. Applied here, it describes the phase where the elongated shadow shortens. The phrase *ilaynā* (to Us) is theologically profound, anchoring the entire physical process within divine agency its origin, operation, and conclusion are all directed towards Allah.[35] The adverbial qualifier yasīran (gently, easily) reiterates the quality of gradual, measured change. Optically, *qabḍ* corresponds to

[33] Al-Razi, *Mafaṭīḥ Al-Ghayb,* vol. 24 (Lebanon: Dār al-Fikr, 1981), 89.

[34] Al-Qurṭubī Abū ʿAbd Allāh Muḥammad ibn Aḥmad ibn Abī Bakr ibn Farḥ al-Anṣārī Al-Khazrajī, *"Al-Jāmiʿ Li-Aḥkām Al-Qurʾān"*, vol 13, (Kairo: Dār al-Kutub al-Miṣriyyah, 1964), 37.

[35] Al-Suʿūd, *Irshād Al-ʿAql Al-Salīm Ilā Mazāyā Al-Kitāb Al-Karīm,* vol. 6, (Beirut: Dār Iḥyāʾ al-Turāth al-ʿArabī, 1998), 223.

the period of decreasing shadow length.[36] This occurs when the solar altitude angle is increasing (e.g., from sunrise to solar noon). The process is, as the semantics demand, gradual and continuous. The term *yasīran* can be seen as describing the smooth, differentiable curve of shadow length versus time. More importantly, the semantic pairing of *madda* (extension) and *qabḍ* (contraction) perfectly encapsulates the complete, cyclic diurnal pattern of shadow behavior.[37] The concluding phrase *ilaynā* offers a theological closure that science does not provide: the natural cycle is not a closed, mechanical loop but a directed process whose beginning and end reside in divine wisdom and sovereignty. It elevates the observation from a physical fact to a sign of ultimate return (*maṣīr*).

This sequential analysis demonstrates that the verse's narrative structure, built on its precise lexicon, exhibits a remarkable conceptual coherence with geometric optics. (1) Observation of a Process (*madda al-ẓill*) Accurately describes the dependent variable (shadow length) changing gradually. (2) Assertion of Contingency (*law shā'a... sākinan*), Philosophically separates the observed law from metaphysical necessity. (3) Identification of the Governing Variable (al-shamsa dalīlan), Correctly identifies the independent variable (sun's position) that controls the phenomenon. (4) Description of the Complementary Process (*qabḍnāhu yasīran*), Completes the model by describing the inverse phase of the cycle. The semantic analysis prevents a common pitfall in *tafsīr 'ilmī*: overclaiming. The verse does not specify the heliocentric model or the Earth's rotation; it describes the observed relative motion between sun and shadow with notable phenomenological consistency. The "scientific miracle" lies not in an anachronistic revelation of modern theory, but in the Qur'an's consistent use of language that is conceptually compatible with the correct scientific model that would later be developed. The terms *madda, dalīl, and qabḍ* form a triad that mirrors the scientific method: observe a change (*madda*), correlate it with a guiding parameter (*dalīl*), and map its full cyclic behavior (*qabḍ*). This semantic-optical coherence strengthens the theological argument, presenting the natural order as one that is intelligible, consistent, and deliberately fashioned a universe where signs are embedded in the very fabric of observable reality for those who reflect.

[36] An-Najjar, *Tafsīr Al-Āyāt Al-Kawniyyah Fī Al-Qur'ān Al-Karīm,*vol. 2, *(*Kairo: Maktabah al-Shurūq al-Dawlah, 2010), 329.

[37] Muḥammad Ḥusayn al-Ṭabāṭabāʾī, *Al-Mīzān Fī Tafsīr Al-Qurʾān,* vol. 15 (Beirut, Lebanon: Muʾassasat al-Aʿlāmī lil-Maṭbūʾāt, 1997), 225.

Semantic and Scientific Analysis of *Ẓill* as a Framework for Harmonizing Revelation, Science, and Moderation in Indonesia

This study culminates in the proposition of a robust, three-layered integrative model, derived from the semantic and scientific analysis of *Ẓill* in QS al-Furqān 25:45–46. This model transcends the specific case study to offer a replicable hermeneutical framework for reconciling divine revelation, empirical science, and the cultivation of religious moderation a trinity of concerns paramount to contemporary Indonesian Islamic thought.

1) The Integrative Three-Layered Model

The analysis demonstrates that a responsible *tafsīr 'ilmī* must proceed through three consecutive, interdependent layers: *First*, *Semantic-Philological Deconstruction*. This foundational layer employs rigorous lexicographical and corpus-based analysis to establish the precise conceptual field of Qur'anic terminology. In our case, this revealed *madda* as "gradual extension," *ẓill* as "protective shade," *dalīl* as "epistemic guide," and *qabḍ* as "controlled retraction." This layer ensures the inquiry remains textually anchored, preventing arbitrary scientific impositions (eisegesis).[38] *Second*, *Historical-Exegetical Mapping*. This layer contextualizes the semantically clarified terms within the living tradition of Islamic interpretation. It traces the evolution of understanding from classical (*tafsīr al-ma'thūr and al-ra'y*) to modern commentaries, identifying continuities and shifts. This step acknowledges the communal and historical intellect (*ijtihād*) that shapes religious understanding, ensuring the model respects tradition while engaging modernity.[39] *Third*, *Conceptual-Scientific Correlation*. Only after establishing the text's intrinsic meaning and its interpretive history does this layer engage in dialogue with modern science. The correlation is strictly limited to identifying structural homologies and conceptual consonance between the Qur'anic description and established scientific principles.[40] For *ẓill*, this meant demonstrating how the phenomenological narrative of

[38] Mostafa Javanrudi and Hossein Rostami, "Semantics of the Word " Dill " (Shadow) in the Holy Qur ' An," 2023.

[39] Muhammad Taufiq, "The Role of Ijtihad in the Renewal of Islamic Thought," *Al-Hikmah: International Journal of Islamic Studies and Human Sciences* 5 (2022): 99–114.

[40] Aini Qolbiyah, Amril M Amril M, and Zulhendri Zulhendri, "Konsep Integrasi Agama Dan Sains Makna Dan Sasarannya," *Jurnal Basicedu* 7, no. 3 (2023): 1924–34, https://doi.org/10.31004/basicedu.v7i3.5711.

orderly, guided change aligns with the mathematical logic of geometric optics, without claiming the verse encodes heliocentric theory.[41] This sequential model is replicable for other cosmological verses (e.g., water cycle, embryology, mountain orogenesis), providing a disciplined protocol that satisfies both theological fidelity and scientific respectability.

This model offers a corrective to two common extremes. It moves beyond the superficial "scientific miracle" discourse that often cherry-picks science to fit the verse, by insisting that the scientific principle must align with the core conceptual meaning extracted semantically and exegetically. It also challenges purely philological studies that ignore the cosmos as a valid field for theological reflection. The model shows that a text-centered approach does not preclude dialogue with science; rather, it provides the necessary controls for that dialogue to be hermeneutically sound.[42]

2) Harmonizing Revelation and Science as Non-Competitive

The Qur'anic conceptualization of shadow (*ẓill*), as analyzed in QS al-Furqān (25:45–46), transcends mere physical description to establish a profound paradigm in which natural phenomena serve as dual-aspect signs, both objects of scientific inquiry and vessels of theological meaning. This dual nature bridges the empirical laws of geometric optics which explain the mechanics of shadow formation, elongation, and contraction with a spiritual invitation to recognize divine wisdom (*ḥikmah*), order (*niẓām*), and sustaining power (*qudrah*).[43] The Qur'anic narrative implicitly encourages a mindset of observation, analysis, and contemplation, thereby positing a fundamental harmony between the structured exploration of nature (*ṭalab al-'ilm*) and the reflective deepening of faith (tafakkur). This integrative perspective finds a robust theoretical foundation in the work of contemporary Indonesian scholars.[44]

The model makes a significant theoretical contribution by reframing the Islam-science dialogue from a battleground of competing truths to a collaborative exploration of a multi-layered reality. It operationalizes the epistemological distinction championed

[41] Alfa Faridh Suni and dan Khoirudin Fathoni, "Klasifikasi Shadow Algorithm," *Jurnal Teknik Elektro* 8, no. 2 (2016): 8–2.

[42] Zaghlur An-Najjar, *Min Asrār Al-Qur'ān* (Kairo: Maqāl bi al-Ahrām, 2001), 12.

[43] Yahyaa Waziirii, *I'jaaz Wasf Azh-Zhill Wa Azh-Zhilaal Fii Al-Qur'aan Al-Kariim,* 2019, http://m-quran.com..

[44] Firani Putri and Wedra Aprison, "Integrasi Agama-Sains Dalam Perspektif Al-Qur'an," *Jurnal El-Rusyd* (2023).

by Indonesian scholars like M. Amin Abdullah. The model assigns to science the domain of the "how" (*kaifa*) the mechanistic, causal explanation of phenomena (e.g., the optical equations governing shadow length). Simultaneously, it reserves for revelation the domain of the "why" (*limādhā*) and the "Who" (man) the teleological purpose and ontological grounding of those same phenomena (e.g., shadows as *āyāt* signifying divine wisdom, mercy, and power). [45] Similarly, Kuntowijoyo's vision of "Ilmu-Ilmu Keislaman Integralistik" (Integralistic Islamic Sciences) calls for the Qur'an to act not as a textbook of facts but as a metacognitive paradigm that guides the ethical and epistemological orientation of scientific endeavor. The analysis of ẓill exemplifies this: the Qur'anic text does not teach optics, but it instills a worldview where the observable uniformity of nature (*sunnatullāh*) is a testament to a single, wise Creator, thereby motivating and framing the scientific pursuit itself.[46]

This approach resolves the chronic tension between "scientific miracle" apologetics and scientistic reductionism. The Qur'an is not a textbook of physics, but its discourse on nature is scientifically intelligible. Its precise semantics create a conceptual schema that is compatible with later scientific discovery, not because it predicts them, but because it describes the observable world with an accuracy that invites and withstands rational inquiry. This establishes a relationship of mutual affirmation without conflation; science elucidates the complexity of the sign (āyah), while revelation discloses its ultimate meaning and Author.[47]

3) *Practical Implications for Integrative Education and Religious Moderation in Indonesia*

The integrative model demonstrated in this study holds significant practical promise for the Indonesian context, particularly in two domains: educational curriculum development and the discourse on religious moderation.[48] The current dichotomy between general sciences (sains) and religious subjects (*diniyyah*) in many educational

[45] M. Amin Abdullah, *Islamic Studies Di Perguruan Tinggi : Pendekatan Integratif-Interkonektif. Pustaka Pelajar* (Yogyakarta: Pustaka Pelajar, 2006), 77-102.

[46] Kuntowijoyo, *Islam Sebagai Ilmu : Epistemologi, Metodologi Dan Etika* (Yogyakarta: Tiara Wacana, 2007).

[47] M. Qurashi, "Basic Concepts of Physics in the Perspective of the Quran," *Islamic Studies Journal* 28, no. 1 (1989): 55.

[48] M Ngisomudin et al., "The Role of Scientific Integration in Strengthening Religious Moderation in Islamic Higher Education Institutions in Indonesia" 19, no. 1 (2025): 1–22.

institutions often leads to compartmentalized learning.[49] The analysis of *ẓill* provides a concrete template for designing integrative teaching modules. For instance, a module on "Light and Shadow" could simultaneously (a)Teach the geometric principles of reflection, rectilinear propagation, and shadow formation (Physics); (b)Analyze the semantic field of *ẓill, madda, dalīl,* and *qabḍ* through Qur'anic and classical texts (Qur'anic Arabic & Tafsīr); (c) Explore the historical Islamic scientific tradition, highlighting figures like Ibn al-Haytham (Alhazen) who revolutionized optics, and al-Bīrūnī who applied astronomy to timekeeping; (d) Facilitate theological reflection on the concepts of sunnatullāh, divine wisdom, and the ethical responsibility of seeking knowledge. This approach fosters holistic thinkers who see science as an act of worshipful inquiry (*'ibādah*) and religion as a catalyst for intellectual engagement with the universe.

Within Indonesia's vibrant Islamic scholarly tradition, *tafsīr 'ilmī* occupies a contested space. Proponents like Agus Purwanto (Ayat-Ayat Semesta) argue for active correlation between Qur'anic verses and scientific discoveries as a means of demonstrating Islam's compatibility with modernity.[50] Conversely, critics such as M. Amin Abdullah caution against reductionist concordism that risks subordinating the Qur'an's polysemic richness to temporary scientific theories. Between these poles, scholars like M. Quraish Shihab advocate for a hermeneutically disciplined approach, where scientific knowledge illuminates rather than dictates interpretation.[51] This study positions itself within this Indonesian methodological debate by proposing a text-first, semantically-grounded model that addresses common criticisms of *tafsīr 'ilmī*: By beginning with semantic analysis rather than scientific theory, By maintaining the multi-layered signification of terms. By tracing interpretive developments across traditions.

Religious moderation in Indonesia is vital in countering radicalism and fostering a pluralistic society. A key aspect of moderation is promoting a balanced, rational, and contextually grounded understanding of religious texts. This study's methodological rigor

[49] Siti Nuhaliza, Hasan Asari, and Zaini Dahlan, "Implementasi Integrasi Nilai-Nilai Moderasi Beragama Dalam Intrakurikuler Keagamaan Di Madrasah Tsanawiyah," *Jurnal EDUCATIO: Jurnal Pendidikan Indonesia* 10, no. 1 (2024): 290, https://doi.org/10.29210/1202424137.

[50] Agus Purwanto., *Ayat-Ayat Semesta: Sisi-Sisi Al-Qur'an Yang Terlupakan. Mizan.* (Bandung: Mizan, 2008).

[51] Quraish Shihab, *Kaidah Tafsir: Syarat, Ketentuan, Dan Aturan Yang Patut Anda Ketahui Dalam Memahami Ayat-Ayat Al-Qur'an* (Tangerang: Lentera Hati, 2013).

offers a direct antidote to interpretive extremism.[52] By demonstrating that a "scientific" reading of the Qur'an must be preceded by deep semantic and historical exegesis, it guards against two extremes: (a) the literalist-fundamentalist tendency to reject science as irrelevant or contradictory to faith, and (b) the modernist-apologetic tendency to force-fit scientific theories onto the text, often resulting in brittle interpretations that change with every scientific paradigm shift.[53] By championing a model where faith and reason engage in a respectful, textually-anchored dialogue, this approach nurtures a religious mindset that is confident yet open, grounded yet intellectually vibrant. It shows that a mature Islamic faith does not fear science but sees the exploration of *sunnatullāh* as a pathway to greater awe of Allah.[54] This epistemological humility and commitment to reasoned dialogue are cornerstones of a moderate and resilient religious society.

Conclusion

This study demonstrates that the Qur'anic description of shadow (*al-ẓill*) in Surah al-Furqān (25:45–46) contains a precise semantic structure that reflects a dynamic natural process associated with the movement of the sun. Through semantic analysis of the key terms *madda*, *ẓill*, *dalīlan*, and *qabḍnāhu*, the verses reveal a coherent narrative of gradual extension, solar indication, and controlled contraction of shadows. When examined alongside classical exegetical interpretations and the principles of geometric optics, this description shows a conceptual compatibility with the scientific explanation of shadow formation and variation. The Qur'anic discourse does not provide technical scientific formulations but offers a phenomenological account of observable natural phenomena that invites reflection on the order and harmony of creation. Methodologically, this study proposes a three-layered analytical framework—semantic deconstruction, exegetical mapping, and conceptual correlation—as a disciplined approach for engaging cosmological Qur'anic verses within the discourse of *tafsīr 'ilmī*. This model emphasizes that scientific interpretation should remain grounded in linguistic

[52] Ade Fakih Kurniawan, "Strategic Management of Religious Moderation in Indonesian Higher Education : An Integrative Islamic Education Perspective" 4 (2025): 260–71.

[53] Abdullah Hanif, Encep Syarifudin, and Ali Muhtarom, "Integration of Religious Moderation in Islamic Education: Challenges and Opportunities in the Digital Era," *Edukasi Islami: Jurnal Pendidikan Islam* 14, no. 01 (2025): 49–66, https://doi.org/10.30868/ei.v14i01.7767.

[54] Yuli Habibatul Imamah, "Integration of Religious Moderation in Developing an Islamic Religious Education Curriculum," *Scaffolding: Jurnal Pendidikan Islam Dan Multikulturalisme* 5, no. 3 (2023): 573–89, https://doi.org/10.37680/scaffolding.v5i3.3841.

analysis and the tradition of Qur'anic exegesis, thereby enabling a balanced dialogue between revelation and scientific understanding.

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