

Investigating the Evolution of the Dome in Iranian-Islamic Architecture from the Perspective of Typology

Abstract

The architecture of the mosque has a distinct place in Islamic art. The Islamic architect, who seeks to give meaning to life and justify his purposeful career, in expressing and embodying monotheism, chooses the geometry that is compatible with his beliefs and thus with the aid of his faith, creates splendid and distinct patterns. Any architectural design is basically a work in the field of geometry that deals with the properties of lines, surfaces and shapes in space. In various manners, Islamic architecture has been used in different architectural traditions. The evolution and the process of dome construction in Iranian buildings took place prior to Islam. In this research, it is strived to focus on the evolutionary course of the dome during different periods and whether domes in the Islamic era underwent alternations compared to the previous eras. It is questioned whether the external and internal form of the domes been constant throughout the Islamic era or have there been modifications? This research has been completed by a descriptive and analytical method and relying on data from library sources, drawing graphs and analyzing information. The results of this research indicate an increase in the external rise ratio of mosque domes until the Mozaffari-Timurid era and a decrease during the Safavid era. It is worth mentioning that the historical course of dome variation in Iranian mosques followed a consistent path from the "Khagi" dome to "Nar" and from the "Nar" dome to "Shabadri".

Research objectives:

١. Explaining the historical evolution of the dome in Islamic mosques.
٢. Exploring the various types of domes in the Islamic architecture.

Research questions:

١. How does the evolution of the dome take place in Islamic mosque architecture
٢. Has the external and internal ratio of dome types been constant throughout the Islamic era?

Keywords: typology, dome, geometry, Iranian-Islamic, mosques.

Introduction

In Iranian culture, similar to other cultures, the dome is a symbol of sphericity and circle. Since the circle is considered the most beautiful and perfect geometric shape, it somehow evokes perfection or the sky. Therefore, it can be said that this element had a decisive role in the components of Iranian architecture in the periods before and after Islam. Mathematics, geometry and the emergence of new tools in several historical periods were among the effects that had a direct impact on the architecture and structure of Iranian domes. The existing historical documents and the results of various researches that have been conducted in this regard indicate that the lack of solid and straight wood panels, which were the main constructive element of the flat roof, caused the dome to be the best solution for many wide roofs. The current research strives to recognize the evolution of Iranian-Islamic domes in various historical periods by focusing on their typology, dimensional proportions and structure. Correspondingly, it is also debated whether the external and internal forms of the domes experienced changes over time. Thus, by analyzing the structure of the characteristic types of domes of various historical periods, the influence of geometry on the structure of single-walled and double-walled domes, as well as changes in form and appearance from early cases to evolved structures are also discussed.

The review of the background of the current research indicates that thus so far no independent research with this title has been published, however, studies in the form of treatises and articles regarding dome architecture have been conducted. Among them: Mohammad Al-Asad (۱۹۹۷), Abdul Hamid Aggkar (۱۹۹۸), Molvi (۲۰۰۲), Aliabadi (۲۰۰۷), Hijazi (۲۰۰۸), Bamanian et al. (۲۰۱۰), Pourahmadi (۲۰۱۰), Ansarinejad and Ebrahimi (۲۰۱۰). Ansari et al. (۲۰۱۳), Mehdizadeh, Tehrani and Valibeig (۲۰۱۳), Issa Hojat and Mehdi Maleki (۲۰۱۳), Mojtabi Rezaei Ardebili and Mojtabi Thabitfard (۲۰۱۳), Azizi and Sarbangali (۲۰۱۴), Dahar and Alipour (۲۰۱۴). Kohifard, Nasrabadi and Dehghan (۲۰۱۳), Nastern Shahrokhi, Leila Zare, Zainab Niknami, and Amirfalahi (۲۰۱۴), Leila Madqalchi et al., (۲۰۱۵) and Elnaz Hanifnejad et al have all studied the dome and its geometrical features. However, in their works, the aforementioned researchers have not investigated the evolution of the dome in Iranian Islamic architecture in terms of typology.

In order to achieve the final goal, by following a descriptive-analytical method and in a theoretical way and with the help of library and documentary studies, it sought to examine the background of the subject, theoretical foundations and conjectural framework of the research concerning the dome, thoughts of intellectuals and its place among different sciences; furthermore, the relationship between architecture, geometry and mathematics is also discussed.

Conclusion

The study and investigation of the structure and typology of Iranian-Islamic domes confirms that the domes used in Parthian works were generally circular and with a height greater than the radius of the circle. Also, the arches used in the buildings of the Sassanid era are of the types of Holochin horseshoe, maze, Sassanian elliptic and egg-shaped without spikes and with freight. In pre-Islamic periods in Iran, due to the lack of use of pointed arches, the height of domes was very high. In the early Islamic centuries, arches were generally used, which were generally slow and sharp, and later, cross arches, which have slow and sharp points. In the later periods, especially during the Timurid and Safavid periods, the decorative sharp arch was used repeatedly. The dominant trend of changing the shape of the dome throughout history has been from the "Khagi" to "Nar" dome and from the "Nar" to "Shabadri" dome. This form change appeared in the shape of the domes despite the fact that it was not optimal in terms of structure and it was necessarily in the direction of arrangement objectives. The separation of single-faced mosques from double-faced mosques is not noticeable, unlike the external rise in height; and these two groups maintain their overlap. In different eras, the dome's outer shell (outer view) is more noticeable and tangible, and the internal proportions of the dome have not changed much.

In the historical path in both types of domes, the average external ratio of the dome of the mosques increases until the Mozaffari-Timurd era and declined during the Safavid era, it rises again until the contemporary period, and of course, it cannot be unrelated to the establishment of Shiism as the official religion of the Safavid era. It may be assumed that the Safavid rulers, as the main employers of mosque architecture, were not reluctant to distinguish themselves from the Sunni opponents of their religion even in mosque architecture - as the most obvious physical manifestation of the religion; in addition, this desire expresses itself in a sharp decrease in the average height of the dome of the built mosques, although perhaps the subsequent increase in the height is not unrelated to the influence that Iranian architects received from European architects as

a result of the increase in international relations of this period. This ratio reaches its maximum even in double domes during the Qajar period.

References

Akkach, s. (۲۰۰۵). *Cosmology and Architecture in Premodern Islam*, University of New York Press, New York.

Eves, H. (۱۹۹۹). *An Introduction to the History of Mathematics*, Sixth edition, Brooks Cole, New York.

Fichbein, E. (۱۹۸۷). *Intuition in Science and Mathematics An Educational approach* Dordrecht, Kluwer.

Godard, Andre. (۱۹۹۸). *Iran's art*, translated by Behrouz Habibi, Tehran: Shahid Beheshti University Press. [In Persian].

Haines, Walter. (۱۳۷۱). *The Lost World of Ilam*, translated by: Firouz Firouznia, Tehran: Scientific and Cultural Publications. [In Persian].

Henry, R. (۲۰۰۷). *Pattern, Cognition and Contemplation: Exploring the Geometric, Art of Iran*, Public Lecture at the Middle East Association on April ۲۷. Published in the journal of the Iran Society.

Heydari, Reza. (۲۰۱۳). "Research on the history and evolution of the dome in Iranian architecture", conference on sustainable urban landscape and architecture, Mehrnaz Shahr International Institute of Architecture and Urban Studies, Mashhad, pp. ۱-۹. [In Persian].

Hoff, Dietrich. (۱۳۷۹). *Domes in Islamic architecture*, translated by: Karamullah Afsar and Mohammad Youssef Kayani, in the book of *Iranian Architecture of the Islamic Period* by Mohammad Youssef Kayani, Tehran: Jihad University Press. [In Persian].

Kharazmi, Mehdi; Fahimi, Reza. (۲۰۱۰). "Applied geometry in the decoration of pre-Islamic architectural works", *Kitab Mah Ulum va Fanon*, special issue of *Islamic Architecture*, pp. ۸-۱۳. [In Persian].

Mahdavi-Nejad, Mohammad Javad; Morteza, Aliabadi and Ghasemi, Ehsan. (۲۰۱۲). "The evolution of Iranian domes from antiquity to Qajar", the first conference on technology and traditional structures focusing on domes, Tehran Institute of Higher Education of Science and Technology, pp. ۱-۱۲. [In Persian].

Memarian, Gholamhossein. (۱۹۸۸). *Niaresh arch structures in Iranian architecture*, Tehran: Iran University of Science and Technology. [In Persian].

Memarian, Gholamhossein; Safaipoor, Hadi. (۲۰۱۱). *Niarsh Iranian architecture*, Tehran: Institute of Higher Education Publications. [In Persian].

Montazer, Behnaz; Sultanzadeh, Hossein. (۲۰۱۷). "Reflection of the regular pentagon pattern in the geometric motifs of Islamic architecture of Iran", Islamic Art Studies Quarterly, No. ۳۰, p. ۲۰. [In Persian].

Mushtaq, Khalil. (۱۳۸۷). Iranian art and architecture in the ancient and Islamic periods, Tehran: Aza Andishan Publishing House. [In Persian].

Nejad Ebrahimi, Ahad; Azizpour Shoubi, Aref. (۲۰۱۸). "Identification of knotted domes in Iranian mosques", specialized scientific quarterly of green architecture, number ۲. (series ۱۰), pp. ۵۲-۴۵. [In Persian].

Pope, Arthur Upham. (۱۹۹۴). Iranian Architecture, translated by: Gholamhossein Sadri Afshar, Tehran: Farhangian Publishing House. [In Persian].

Pope, Arthur; Ackerman, Phyllis. (۲۰۰۲). A journey through Iranian art, from prehistoric times to today, Tehran: Siros Publishing. [In Persian].

Pirnia, Karim. (۱۹۷۲). "Armaghans of Iran to the world of architecture", Art and People Magazine, pp. ۱۳۷-۱۳۶. [In Persian].

Pirnia, Mohammad Karim. (۱۹۹۱). "Dome in Iranian architecture", collection of Zohreh Bozor Mehri, Art magazine, number ۲۰. [In Persian].

Pirnia, Mohammad Karim. (۱۹۹۱). "Dome in Iran's architecture", collection of Zohreh Bozor Mehri, Art magazine, number ۲۰. [In Persian].

Pirnia, Mohammad Karim. (۲۰۰۱). Iranian architectural stylistics, Tehran: Soroush Danesh publication. [In Persian].

Rasenthal, F. (۱۹۷۰). Eilhard Wiedeman, Aufsätze Zur Arabischen Wissenschaft Geschichte, Vol.I, New York, G. Qlms.

Rezaei, Abdulazi. (۱۹۹۹). Treasure of Iranian history, vol. ۱۲, Tehran: Islamic Farhang Publishing. [In Persian].

Sadegh Zadeh, Rizvan. (۲۰۱۵) "The function of geometry and balance in the formation of Khalil Mosur's works". Islamic Art Studies, No. ۲۵, p. ۲۱. [In Persian].

Shawazi, August. (۲۰۰۲). History of architecture, translated by: Latifullah Abolghasemi, Tehran: University Press. [In Persian].

Wilbur, Donald. (۱۳۶۵). Islamic architecture of the Ilkhanan period, translated by Abdullah Faryar, Tehran: Scientific and Cultural Publications. [In Persian].

Zamrashidi, Hossein. (۲۰۱۰). Iran's Dome and Arch Elements, Tehran: Zaman Publishing House. [In Persian].