PROSTOR

31 [2023] 2 [66]

A SCHOLARLY JOURNAL OF ARCHITECTURE AND URBAN PLANNING
ZNANSTVENI ČASOPIS ZA ARHITEKTURU I URBANIZAM

UNIVERSITY OF ZAGREB FACULTY OF ARCHITECTURE
SVEUČILIŠTE U ZAGREBU ARHITEKTONSKI FAKULTET

ISSN 1330-0652
https://doi.org/10.31522/p
CODEN PORREV
UDC 71/72
31 [2023] 2 [66]
139-324
7-12 [2023]

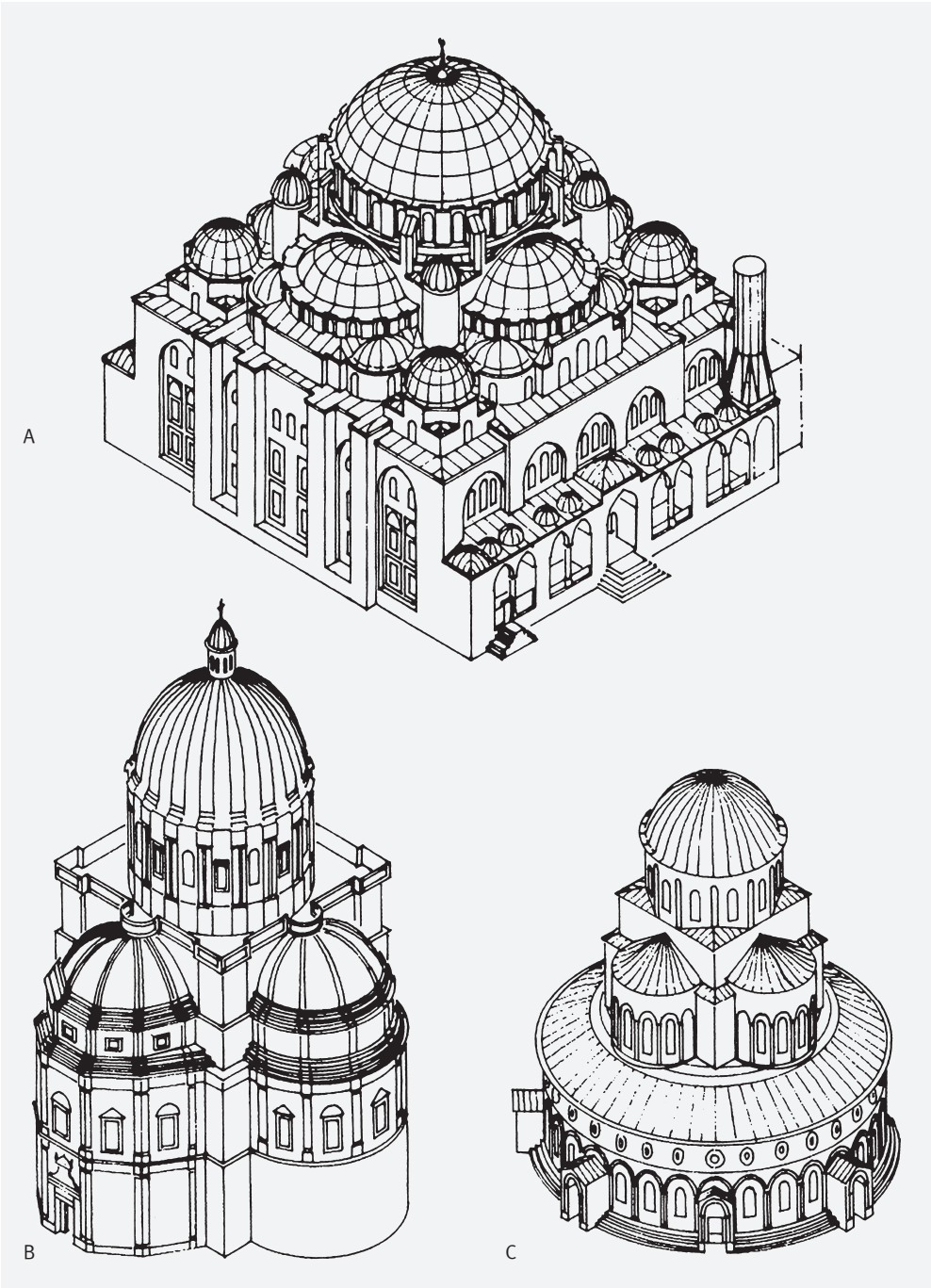

Fig. 1 A – Axonometric views of Sehzade Mosque (1543-1548), B – Santa Maria Della Consolazione (1508-1607), C – Zwartnotz (643-652)

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Scientific Subject Review
https://doi.org/10.31522/p.31.2(66).11
UDC 692.44 023.465 Sinan
Technical Sciences / Architecture and Urban Planning
2.01.04. – History and Theory of Architecture and Preservation of the Built Heritage
Article Received / Accepted: 13. 6. 2023. / 20. 12. 2023.

Sinan the Architect's Process of Creating Spatial Typology: Octagonal Based Central Domes

ARCHITECTURAL COMPOSITION
HISTORY OF STRUCTURE
MOSQUE
OCTAGONAL CANOPY DOME STRUCTURE
Sinan the Architect

The article explores the process of central planning development and dome-bearing systems analysis in mosques belonging to Classical Ottoman Architecture, focusing on the typological plan variations found in Sinan the Architect's octagonal-based central domes. It is aimed to determine the spatial typology of these octagonal based central domes, as they play a crucial role in creating a central space in mosques. The typology studies focused on the load-bearing systems in central dome designs of eighteen surviving mosques designed by Sinan the Architect. The study method involves scanning scientific publications, state archives, and photographing mosques. Mosques ground floor plans, including their dome projections and sectional drawings, have been examined. Gathering all the data from analysing the transfer of the dome load enabled a categorisation of eighteen mosques that can be classified into two primary groups and three sub-groups within each group.

INTRODUCTION

Sinan the Architect played a pivotal role in fulfilling the functional and symbolic requirements of the Ottoman Empire during its foundation years. How he perceived the construction methods of his era while constructing structures for the Empire inspires today's scholars to analyse his buildings from a variety of perspectives, including cultural significance and architectural integrity. Between 1538 and 1588, as the leader of the Hassa Architects Association, Sinan embodied the cultural values and knowledge that summed the knowledge of the civilisations spread across the vast geography of the empire throughout history, during the reigns of Murat III, Selim II and Suleiman the Magnificent (Kuran, 1986).

The study methodology comprises scanning scholarly publications on the subject, including government archives, and conducting photographic studies by visiting mosques within the scope of the article. Ground floor plans, which contain dome projections and sectional drawings, were examined for mosques. Sketches and photographs were analysed and octagonal based central dome mosques were categorised in tables based on their supporting system. For structural analysis of load-bearing systems, 3D presentations were created. The conclusion presents a typology of plans derived from the load-bearing structures in Sinan the Architect's mosques with octagonal based central domes. This typology comprises two primary categories. The first one pertains to "octagonal based central domes carried by the main walls", while the latter concerns "octagonal based central domes with a massive free-standing pillar inside *(pilpaye)*".

To explain the development of the central spatial organisation in mosques, this study explains the use of the dome in Islamic architecture, the development of the central dome plan typology in the Classical period of the Ottoman Empire, the applied differences in the load transfer principles in the central dome, the formation of the canopy system and the variations of the octagonal-based central dome interpretation.

THE EFFECT OF THE DOME ON THE SPATIAL DEVELOPMENT OF THE OTTOMAN EMPIRE MOSQUES

Turks' first encounter with islamic architecture was through military structures called ribat, which were built for the control of border lines and trade routes (Coruhlu, 2000). To follow the structural and spatial effect of the dome in mosque architecture, traces go back to the Ribat-i Malik (Fig. 2), which was built by Shams al-Mulk during the Qarakhanids period in the 11th century, one of the first examples of ribat structures in Central Asia, which are identified with caravanserais in Turkish culture (Cezar, 1997). The mosque had a minor role in the ribat framework, while the dome was utilised in the courtyard to establish cohesiveness in the central area.

Although the upper cover of the Lashkar-i Bazar Saray Mosque (Fig. 4) built during the Ghaznavid period (963-1187) has not survived to the present, it is understood from the excavations that the width of the mosque was planned wider than its length and a dome was built over it to emphasise the *mihrab* space. *Mihrab* is a niche in the wall of the mosque that indicates the *qibla*, the place in the mosque to which one turns to pray (Hasol, 1993: 255). The dome, which is known to have been constructed of brick, has been used to emphasise the space (Altun, 2002a).

The Qarakhanids, who ruled as an Islamic state in today's East Turkistan and Central Asia, developed their first unique mosque examples in the 11th and 12th centuries. The Qarakhanids were pioneers in implementing the central plan scheme as a mosque typology, featuring examples where the use of a dome is evident, signifying the expansion of space (Coruhlu, 2000). Sir-Kebir Mosque drew the most attention in its period with its dome size of 11 meters in diameter. Talhatan Baba Mosque, constructed in the late 11th and early

12th centuries, was built entirely of brick. The building has a transversely wide rectangular plan scheme and the diameter of the dome in front of the *mihrab* is equal to the width of the building. Thus, the dome is perceived as the dominant element of the *harim*, an interior space reserved for prayer (Hasol, 1993: 196). This feature of the mosque is a source for the Ottoman classical period works where the central plan was developed towards the sides (Altun, 2002b).

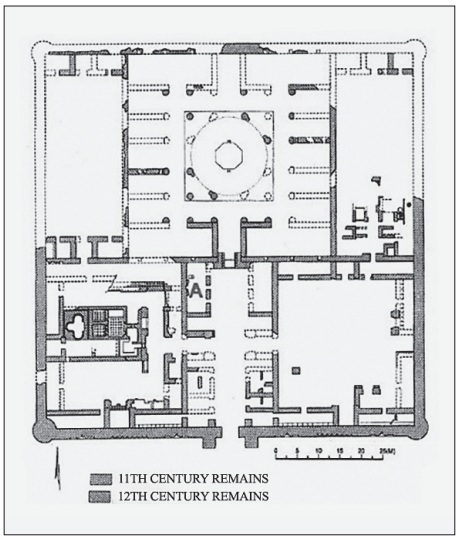
As the Great Seljuk Empire rose to power, a new type of mosque architecture began to emerge (Eyice, 1993: 46-90). The Juma Mosque in Isfahan (1121 A.D.), with its 14-meter dome, can be considered the first example of the four *iwan*: vault/dome covering a rectangular planned volume (Hasol, 1993: 56), a building type that emerged in Iran during the Seljuk rule. The dome of the building, which was built with four *iwans*, is also in front of the *mihrab* (Fig. 3).

In the 13th century, the basilica-style layout type was developed, influenced by the construction plans of churches in Anatolia. Different interior spaces were produced with similar floor plans. While the Nigde Alaeddin Mosque has three different domes in front of the *qibla*, the Amasya Burmali Minaret Mosque has three domes lined above the central passage. Amasya Gok Madrasa Mosque has a plan with three domes constructed both transversely and longitudinally. The Turkish triangle was used in the transition of the dome of the Konya Karatay Madrasa, which is more than 12 meters in diameter, to a square plan. These are considered to be the first examples of early Ottoman mosques (Sezgin, 1984). In terms of the development of the methods used in the transition from the dome to the square base, this period was a preparation for the mosque architecture of the Ottoman Classical Period.

Manisa Great Mosque, whose restoration work was completed in 2020, is an important data source. As can be seen in Fig. 5, built by Saruhangullari in 1375 in Manisa, it is among the important cases of domes with multiple carriers in this period. The pendentive dome with a diameter of 10.80 meters resting on the octagonal support system is as wide as three naves, thus creating a collective and wide central space (Yetkin, 1955). While the use of the dome, which was built according to the octagonal plan, is mostly found in tombs, the Manisa Great Mosque is ranked as the first mosque example in which this dome form was used in Anatolia.

Considering the developmental line in the use of the octagonal based domes, Diyarbakir Parli (Safa) Mosque (1453-1578), dating to the Akkoyunlu Principality period, is considered an important example by Sozen (Fig. 6). When the planning scheme is examined, it may be seen that the main space with a hoop, squinches, and a central dome that sits on an octagonal base expands to the east and west with cradle-vaulted side spaces (Sozen, 1982). Its dome, which is covered with a pyramidal cone, is still far from being a central emphasis (Tuncer, 1996).

The Ottoman-era mosques emerged from consolidating the cultural infrastructure in Anatolia, a region rich in diverse civilizations and other lands under its jurisdiction,



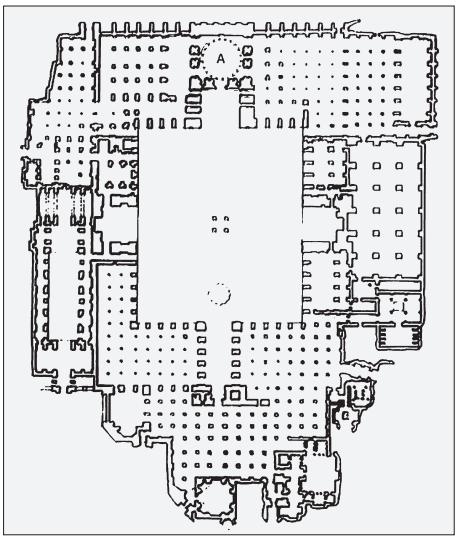
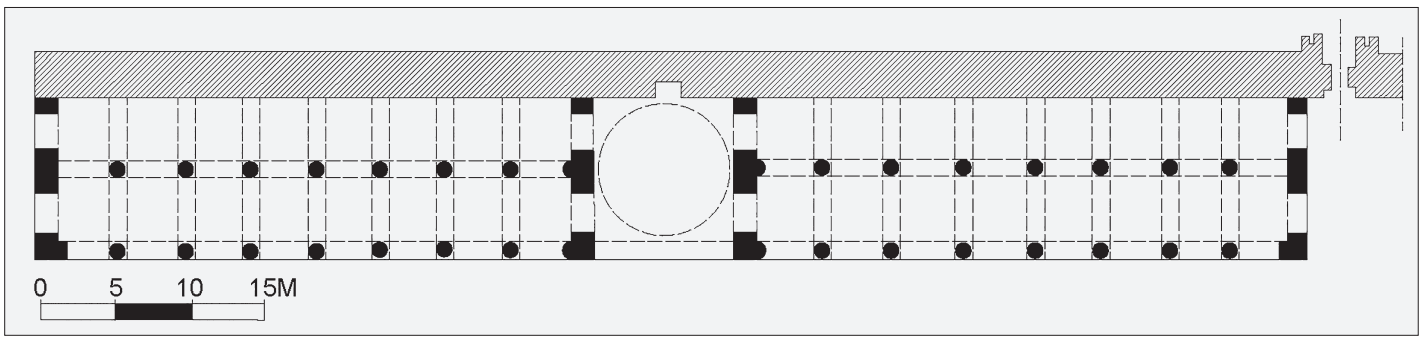


Fig. 2 Plan scheme of Ribat-i Malik (11 a.d.), estimated to be built between 1078 and 1079 by the Qarakhanid Ruler Nasser Bin Ibrahim Al-Shams Al-Mulk. The building is located near Kermin in the Malik steppe between Bukhara and Samarkand. The use of a dome in the ribat is only in the courtyard. The mosque is the area marked with "a".

Fig. 3 In the Juma mosque plan in Isfahan, the dome (a) was used to emphasise the *mihrab* and to increase the influence of the interior space

Fig. 4 Lashkar-i Bazar Great Mosque with its dome emphasising the mihrab, Afghanistan



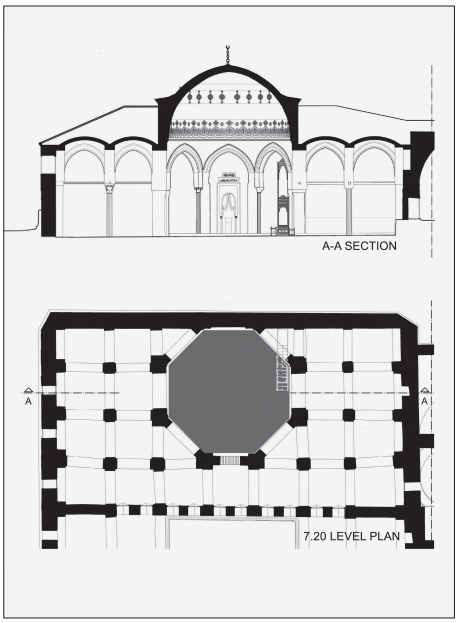


Fig. 5 (up) Representation of the dome sitting on an octagonal base placed on the width of three naves in the Manisa Great Mosque according to the plan and section drawings.

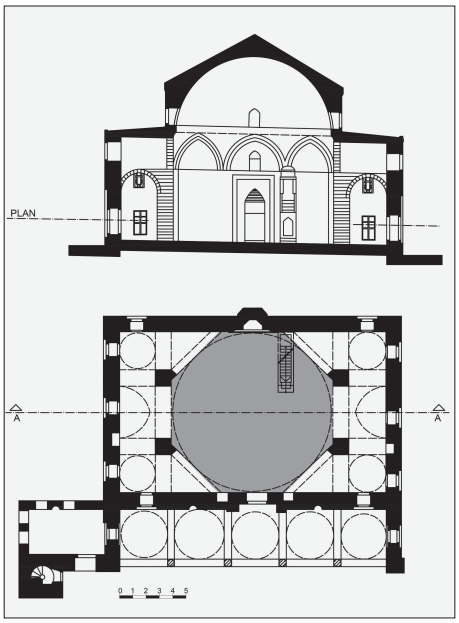
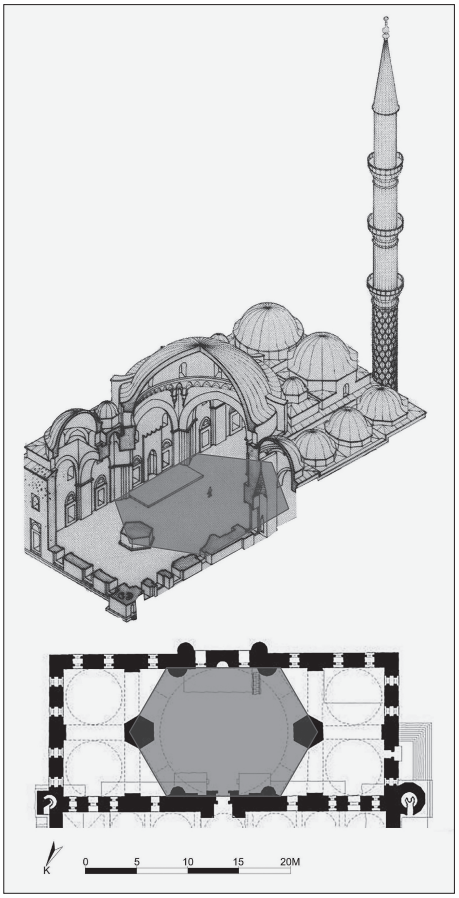


Fig. 6 (up) Plan design and section of Diyarbakir Parli (Safa) Mosque
Fig. 7 (down left) Edirne Uc Serefeli Mosque's dome positioned on hexagonal base in scheme



with the Turkish-Islamic ideology (Delius and Hattstein, 2009).

The architectural cultures of the Seljuk, Byzantine, and Roman civilizations that lived in Anatolia prior to Ottoman rule are evident in the structures built in Anatolia. The octagonal-based central dome system of Sinan the Architect, the subject of this article, is seen in the martyrdom and baptiserium structures of Rome in the 5th century (Eyice, 1988a: 46). In Byzantine architecture, it was first seen in the 6th century. The Church of Simeon (6th century) in the province of Hatay, Turkiye, the Church of Saints Sergius and Bacchus (Little Hagia Sophia Mosque, 6th century) located in the historical peninsula of Istanbul-Kadirga settlement, and the Church of Daphi (11th century) on the Greek island of Chios can be given as examples (Eyice, 1988a: 48).

The articles by Akyuz, 2019; Erarslan, 2018a, 2018b, 2020a, 2020b; Alioglu and Koroglu, 2011; Tuluk 2006 aided the literature research for this article in terms of the associating square, hexagonal and octagonal canopy system with different spatial variations. Furthermore, a comparative analysis was conducted to examine the organisation of the side space and its relationship to the covering structure at mosques where Sinan the Architect integrated the octagonal canopy system. This is one of the multi-load bearing systems that he employed to establish a central main space.

However, during the resource collection process, no study was found that deals with the load-bearing system, the organisation of the space where the main dome is located, its structural construction, and the relationship with the plan typology of Sinan the Architect's octagonal based centrally designed domed mosques. Thus, this article sets itself apart from other studies in this field by focusing particularly on the architectural plan typology according to how octagonal based central domes transfer their weight. Within the scope of this classification, eighteen octagonal-based central domed mosques by Sinan the Architect have been examined.

It is of particular importance to follow up the process since all the works examined have the characteristics of value shaped by global dynamics during history, and their formation must be evaluated with the information in their infrastructure. The study aims to examine the impact of domes on the spatial design of Ottoman mosques, to classify Sinan the Architect's central-domed mosques based on octagonal central domes, and analyse differences in space-structure-plan typology and load transfer principles.

During the 14th century, Ottoman Mosque architecture underwent substantial developments in terms of creating monumental spaces. Specifically, the dome emerged as a fundamental structural element of architectural design. During the early period of Ottoman architecture, regional construction techniques were utilized to create various types of mosques. These include single-domed mosques: Iznik Haji Ozbek Mosque and Iznik Green Mosque; multi-column/multi-domed mosques: The Grand Mosque of Bursa and The Old Mosque of Edirne; and tabhane/zaviye mosques: Bursa Orhan Gazi Mosque and Edirne Muradiye Mosque (Benian, 2011). *Tabhane,* where guests coming to the mosque were hosted and rested, and *zaviye,* accommodation, and resting places for travelling clergymen, were incorporated into early period mosque typologies (Hasol, 1993: 103).

While the different interpretations and trials of the dome in mosque architecture continued in the Early Ottoman Period, Edirne Uc Serefeli Mosque, whose building was ordered by Sultan Murad II between 1437 and 1447, implies a surprising development in this process, especially with the size of its dome and distinctive support system (Fig. 7). According to Kuban, the dome with a diameter of 24.10 meters in front of the *mihrab* creates a wide, monumental space in the cloistered and oblique rectangular planned sanctuary section of the building, which is considered to have been built by architect

Muslihiddin and constructor Sehâbeddin. The dome, which sits on a polygonal drum in the centre, rests on four piers embedded on the wall in the south and north directions and two free-standing hexagonal pillars in the east and west directions. In this mosque, the dome is supported by a hexagonal base creating a spacious central area (Akcil Harmankaya, 1992: 227).

The dome, which is a common element for each different typology, was used in its simplest form, unlike its contemporary and previous interpretations (Benian, 2011). This plain state in which the spatial perception does not differ in terms of the impression regardless of the interior and exterior is significant in terms of architectural style. It is observed that the dome, which is used in the form of a hemisphere, expands over the whole of the building as a unit module (Kuban, 2009).

Mosques constitute the largest structures of Classical Ottoman Architecture in the act of constructing symbolic monuments, which are considered as one of the embodiments of God's representation on earth endowed with the administrative and military power of the period. The mosque, which is one of the focal crossroads of social life in Islam, transformed into *kulliye* (an Islamic-Ottoman social complex) surrounded by large building groups that were built around the central mosque for education, health, and similar purposes separate from worship; these complexes affected the urban development of their time, organized their immediate surroundings, indicated the urban skyline, and functioned as a city square with their courtyard.

In the classical period Ottoman buildings, the dome was preferred as the upper cover of the spaces and used as a "unit module" in design. In later periods, the symbolic value of the dome in Islamic religion was an attempt to find a response with a single dome. Sinan the Architect also built mosques in which he supported the central dome with half domes, but as can be seen from his works, he continued to work on gathering those who came to worship in the mosque in a single and central dome, and at the end of his life he built the "Selimiye" Mosque with its large dome carried by eight legs which is considered as his magnum opus. The dome is 31.30 meters wide and 42.25 meters high (Mulayim & Cobanoglu, 2009).

Fundamental Differences in the Use of Dome in the Classical Period Ottoman Mosque Architecture

When comparing Sinan the Architect's efforts to create central spaces with domes to those of different eras in Europe, Figure 1 exhibits diverse interpretations of how central domes are supported by half domes or vaults. In the Sehzade mosque, the central space is sought with a single large dome and auxiliary domes.

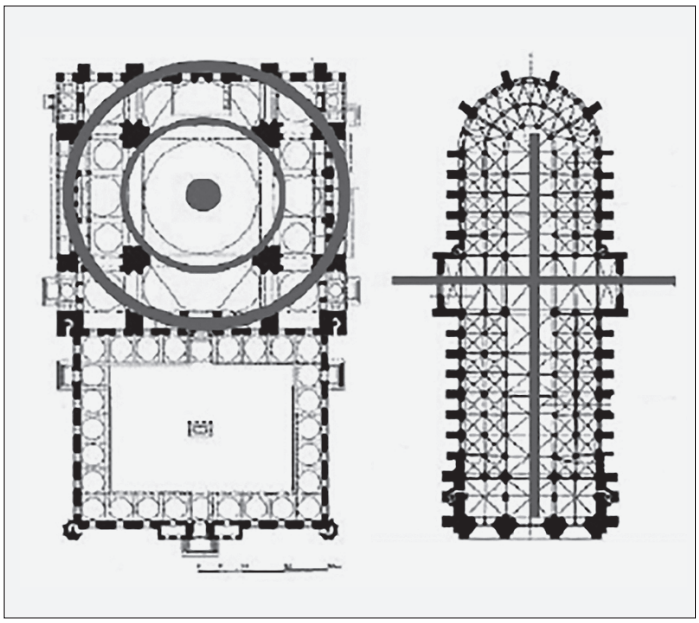


Fig. 8 An Ottoman classical period mosque (Suleymaniye Mosque, 1557) and a typical cathedral plan (Notre Dame Cathedral, 1345)

The fundamental spatial difference between Byzantine interior cross structures and the Sehzade Mosque is that the former utilizes four half domes fused with a central dome system. Two structures that exemplify this difference are the Zwartnotz Chapel (7th century) in Vagharshapat, the ancient capital of Armenia, and the Santa Maria della Consolazione in Todi (Kuban, 1987).

When examining the use of domes in Christian religious architecture, rectangular spaces are typically favoured over other shapes. Figure 8 depicts the fundamental layout of a traditional Ottoman Mosque and a cathedral. Sinan the Architect displayed great interest in the unique characteristics of the Hagia Sophia Church located in the Sultanahmet area of Eminonu, Istanbul, and consequently, incorporated diverse structural interpretations of the same rectangular design and dome arrangement in works such as the Beyazid Mosque, the Suleymaniye Mosque, and the Kilic Ali Pasha Mosque. As he designed domes and semi-domes to cover buildings with structures ranging from his initially basic square to the later hexagonal and octagonal ones, Sinan had to deal with structural problems related to the size of the space involved (Gunay, 2006).

This situation was one of the factors supporting the central domed mosques designed by Sinan the Architect. Although comparable structures were encountered in Roman, Byzantine, Anatolian, and Christian architecture

Table I Plan typology of octagonal central domes in the classical period of Ottoman history of structure

Octagonal Based Central Domes Carried by the Main Walls	Octagonal Based Central Domes Carried Only by the Main Walls
	Octagonal Based Central Domes Carried With Pillars Protruding from the Main Walls
	Octagonal Based Central Domes Carried Main Walls and Supported by the *Mahfil* (Interior Loggia)
Octagonal Based Central Domes Carried with *Pilpaye* (massive free-standing pillar inside a mosque) (octagonal canopy dome structure)	Four Pillars in the Middle and Four Pillars on the Wall Type
	Six Pillars in the Middle and Two Pillars on the Wall Type
	Eight Pillars in the Middle Type

before the Ottomans, the advanced level of centrally planned space type achieved in Ottoman mosques is unprecedented (Kuban, 2009). The dome plays a significant symbolic role in mosque structures. To establish structural integrity and ensure stability, the canopy system was diversified, transferring the structure load to building elements rather than the wall. This enabled the creation of a rich variety of plans in the organization of space through rectangular, hexagonal, and octagonal designs.

Classification of Sinan the Architect's Central Domed Mosques with an Octagonal Design

Sinan the Architect's central-planned structures are shaped according to dome structures, with dome compositions forming the interior and entire building mass (Sozen, 1975: 123).

Within the scope of the study, on-site examination, photography, and sketch studies were carried out. Eighteen mosques were classified under the attribution Sinan the Architect according to the biographies that still exist today, the domes of which rise on the traces of an octagonal based central dome plan. According to the classification using the information obtained for the plan analysis over the space-structure organization, taking into account the order of the main walls, piers, *pilpaye* (massive free-standing pillar inside a mosque), dome's embroidery frames, buttresses, squinches (Kuban, 1970, 1987, 2009, 2011; Erzen, 1988; Eyice, 1993; Table I) was created, and in the continuation of the study, descriptions of the structures were made according to their tags and the load transfer patterns of their domes.

Octagonal-Based Central Domes Carried by the Main Walls

In this group of structures, as seen in Table I and explained below, in terms of structural aspects, three different situations have been identified for the transfer of the dome load.

Octagonal Based Central Domes Carried Only by the Main Walls

Uskudar Semsi Ahmet Pasha Mosque, Izmit Pertev Pasha Mosque, Istanbul Haseki Sultan Mosque, Ankara Cenabi Ahmet Pasha Mosque, Mostar Karagoz (Sofu/Haci) Mosque, Van Husrev Pasha Mosque, Edirne Defterdar Mustafa Pasha Mosque, and Diyarbakir Iskender Pasha Mosque, which have been determined to be the works of Sinan the Architect, are single-domed mosques that sit on an octagonal base, and their domes are supported by the main walls. Pointed arched squinches were employed in these mosques in the transition from the square plan to the round dome to transfer the load of the dome.

The Semsi Ahmet Pasha Mosque ordered to be built by its eponymous, is on the Harem coastal road in Uskudar, Istanbul. Semsi Ahmet Pasha was one of the viziers who served Devlet-i Aliye (the Sublime Porte/Ottoman State), and the building was completed in 1580, the year of his passing (Ayvansarâyî et al., 2001). Its dome, which is placed on an octagonal frame, is supported by squinches in the interior corners, which can also be perceived from the facade. No buttresses support the dome from the outside. As can be seen from the plan, it is the "thick main walls" of the structure that meet the squinches and carry the load of the dome.

The Pertev Pasha Mosque is a part of the complex structure built between 1572 and 1579 in the name of Pertev Pasha at the centre of Kocaeli Izmit (Kuran, 1988). The mosque, which is in the centre of the *kulliye*, where only its traces are found today, has a rectangular plan close to a square and has a central dome with a shallow drum. The squinches that provide the passage to the dome are visible on the upper layer, outside the mosque. The buttresses supporting the shallow drum can be seen from the front.

The Istanbul Haseki Sultan Mosque, located in the *kulliye* of the Haseki district in Istanbul, was built between 1538-35 and 1551 (Cantay, 2002). With the addition of the domed square space during the reign of Sultan Ahmet I, the structure became a double-domed building. The rimmed dome, which is built on an octagonal base and placed on the main walls with sliced squinches, has four buttresses.

The Cenabi Ahmet Pasha Mosque was built in Ankara in 1566 in the name of one of the viziers of Suleiman the Magnificent (Kuran, 1988). Its dome is supported by shallow drums and buttresses. There are squinches at the four corners of the dome.

The Mostar Karagoz (Sofu/Haci) Mosque was built in 1557-1558 in the name of Mehmet Bey, the brother of Grand Vizier Rustem Pasha (Kuran, 1988). Its dome, which sits on an octagonal drum, is supported by squinches at the corners; there is a shallow drum on the dome, but unlike in the Semsi Ahmet Pasha Mosque, the buttress was not used.

The Husrev Pasha Mosque forms the core of the complex in Van City. The mosque, which is the work of Sinan the Architect, is dated 1567 (Kuran, 1988). The sanctuary, which has a nearly square-shaped plan, is covered by a

dome with squinches. A shallow drum was built on the dome and buttresses were used.

The mosque was built by Sinan the Architect in 1576 at the order of the head of the provincial treasury Mustafa Pasha in Edirne (Kuran, 1988). The dome resting on an octagonal base has a shallow drum but no buttress. The transition from the square-based structure to the dome in the interior is provided by pointed arched squinches.

Diyarbakir Iskender Pasha Mosque was built upon the request of Diyarbakir Governor Iskender Pasha in 1551. The building does not have an inscription, but its name is mentioned in *Tuhfetu'l-mi'marîn* (Sinan the Architect's autobiography). The dome of the building, which rests on an octagonal base, is made with a rim, and there is no buttress support (Karakaya, 2000). Squinches are intermediate structural elements in transferring the load of the dome to the body walls.

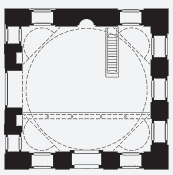
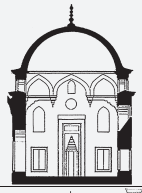
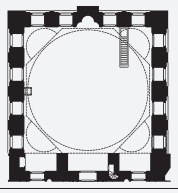
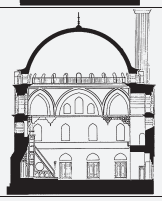
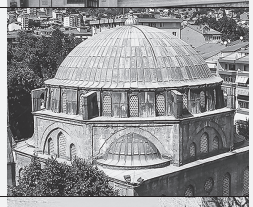
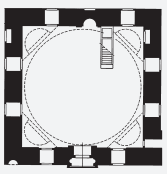
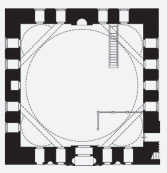
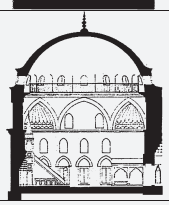
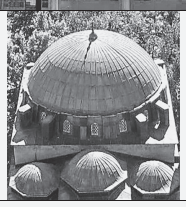
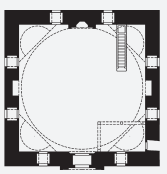
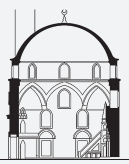
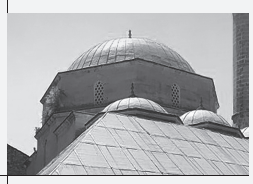
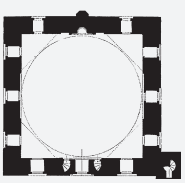
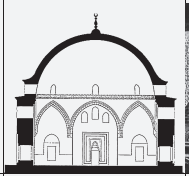
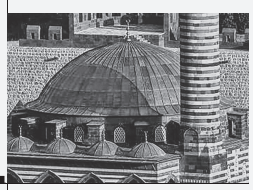
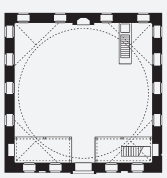
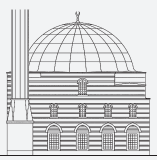
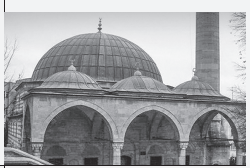
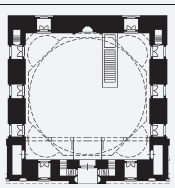
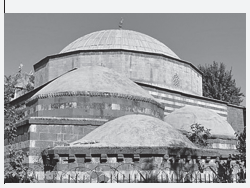
As can be seen from the plan and section schemes of the examined eight structures, the dome was placed on an octagonal base, and a shallow drum was added. In the transition from the square-based plan scheme to the octagonal-based central dome, squinches were used as intermediate elements transferring the structural loads.

In Semsi Ahmet Pasha Mosque, Van Husrev Pasha Mosque, Edirne Defterdar Mustafa Pasha Mosque, and Diyarbakir Iskender Pasha Mosque, buttresses were not used on the dome drum. Others possess buttresses due to the need for support. It is the main walls that meet the dome load of the mosques, and since the openings in these structures are not large, the weight tower, which is one of the symbolic building elements of classical period Ottoman architecture, was not used. The plan/sectional schemes and photographs of these mosques are shown in Table II to support the explanation.

Octagonal Based Central Domes Carried with Pillars Protruding from the Main Walls

The mosques with an octagonal plan, a single dome and a dome carried with piers as identified in the literature review are the Silivrikapi Hadim Ibrahim Pasha Mosque, the Aleppo Dukaginzade Mosque, the Diyarbakir Behram Pasha Mosque, the Tokat Ali Pasha Mosque, and the Tekirdag Rustem Pasha Mosque. How the wall piers in these examples carry the octagonal base dome is often confused with that of the Fatih Bali Pasha, Kayseri Haci Dogan, and Bagdat Abdulkadir Geylani Mosques. For this reason, it would be useful to explain that the domes of the last three

Table II Octagonal based central domes carried only by the main walls

	PLAN	SECTION	REALIZATION
Uskudar Semsi Ahmet Pasha Mosque Sources: – Ülgen, 1941, Plate 121 – Ülgen, Plate 122 – https://tr.wikipedia.org/wiki/%C5%9Eemsi_Pa%C5%9Fa_Camii			
Izmit Pertev Pasha Mosque Sources: – Ülgen, 1938 Plate 119 – Ülgen, 1938 Plate 120 – https://tr.wikipedia.org/wiki/Pertev_Pa%C5%9Fa_Camii			
Istanbul Haseki Sultan Mosque Sources: – Ülgen, 1939 Plate 7 – Ülgen, 1939 Plate 7 – https://www.turanakinci.com/portfolio-view/aksaray-haseki-hurrem-sultan-camii/			
Ankara Cenabi Ahmed Pasha Mosque Sources: – Ülgen, 1941 – Ülgen, 1941 – https://www.ankarabeyfendisi.com/?p=1310			
Mostar Karagoz (Sofu/Pilgrim) Mosque Sources: – Necipoğlu, 2005: 441 – Necipoğlu, 2005: 441 – http://geziyazilarim.com/bosna-hersek/mostar/			
Van Hüsrev Pasha Mosque Sources: – Ülgen, 1949 Plate 85 – Ülgen, 1951 Plate 86 – https://www.kulturportali.gov.tr/turkiye/van/gezilecekyer/husrev-pasa-cam955058			
Edirne Defterdar Mustafa Pasha Mosque Sources: – Necipoğlu, 2005: 483 – Necipoğlu, 2005: 483 – https://kalerestorasyon.com.tr/Calisma_Detay/edirne-merkez-defterdar-mustaf-23			
Diyarbakir Iskender Pasha Mosque Sources: – Necipoğlu, 2005: 484 – Necipoğlu, 2005: 484 – https://www.flickr.com/photos/sinando-gan/32655271567			

mosques mentioned were carried by squinches, pendentives, and walls. In the instances being discussed, as the piers do not reach the height of the dome, they are incapable of supporting the dome and instead only support the galleries. Therefore, the domes of these mosques do not have an octagonal plan scheme.

The method of transferring the load of the mosque domes within the scope of the study is explained under separate headings, accompanied by information on the structures, and their plan, section and views are presented in Table III.

The Hadim Ibrahim Pasha Mosque is in Istanbul Silivrikapi in the Cambaziye Neighborhood on Silivrikapi Street in a building group consisting of a mosque, an open shrine, a Turkish bath, a school, and a fountain. According to the building inscription in *thuluth* Arabic script, the mosque was built in 1551 (Eyice, 2000). The builder became the Anatolian Governor during the reign of Suleiman the Magnificent, served as the district governor of Istanbul with the rank of vizier, and served as the third vizier in 1553 (Cobanoglu, 2019). The building is the first example of the mosque type with a central dome with an octagonal plan and attracts attention with its mass rising in the form of cubic blocks. Sinan the Architect constructed pillars protruding from the main walls that overflowed into the interior space of the mosque, placing the octagonal canopy supporting the dome within the walls in all directions (Sonmezer, 2003: 48).

The twelve-meter diameter round-rimmed dome of the mosque, which is surrounded by a support arch from the outside, sits on squinches supported by a stalactite console. The squinches do not rest directly on the main wall but sit on the wall buttresses that surround the building from three directions, and the weight of the dome is transmitted to the wall buttresses through pointed arches. The dome drum is supported by double-arched buttresses at the corners of the cubic structure. This design, which adds depth to the space by creating deep niches on the east, west, and north walls, is important in that Sinan the Architect tried an octagonal structure instead of a dome that sits directly on the walls with squinches. Although the dome area is limited to the square in the interior, it is thought to be the first attempt to distribute the load of the dome to eight points (Batur, 1969). Although this solution does not seem innovative after the dome with an octagonal plan was freed from the main walls in the Manisa Grand Mosque, it defines a step in the process leading to the Selimiye Mosque for Ottoman architectural traditions.

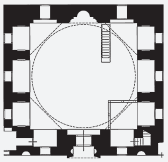
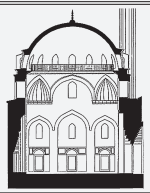
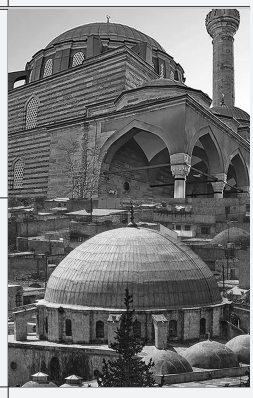
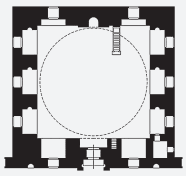
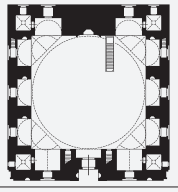
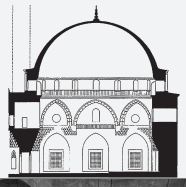
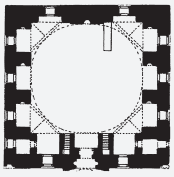
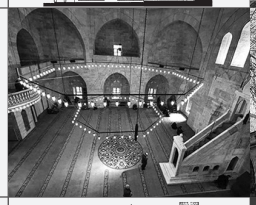
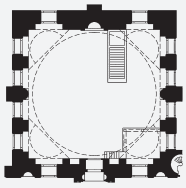
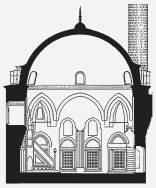
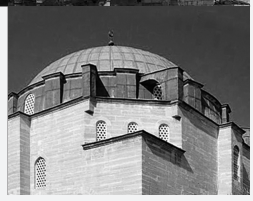
The Dukaginzade Mosque is in the Dukaginzade Mehmet Pasha Complex in Aleppo, Syria. Mehmed Pasha, who gave his name to the mosque, is the son of Dukaginzade Ahmed Pasha, one of the grand viziers of Sultan Selim I who was the Governor of Aleppo between 1551 and 1553 (Hadjar, 2000). Researchers have put forward different opinions about the construction date of the building. Considering the foundation charter of the building, it is stated that the construction of the building started in 1556 and was completed in 1565-1566 after the death of Mehmed Pasha (Necipoglu, 2005: 475), and it is dated to the years 1555-1566 (Kafescioğlu, 1999). In the sanctuary of the mosque, the piers protruding from the walls on the north, east, and west facades created three deep pointed, and arched niches in each of these directions and two in the north direction. The wall piers rise to the dome and there is no *mahfil* (interior loggia) arrangement to prevent the carrier status of the piers. In this situation, it is seen that the bearing features of the piers are still present (Cobanoglu, 2019).

The Behram Pasha Mosque, located in Diyarbakir, is in the south of the city, in the vicinity of the Mardin Gate. The mosque was built by Behram Pasha, who was the thirteenth Ottoman governor and governor of Diyarbakir, and the inscription on its door shows that it was built between 1564 and 1573. It is stated in *Tuhfetu'l-mi'marin* that the work belongs to Sinan the Architect. The octagonal dome drum, which is supported by removing the piers from the main walls, meets the squinches at four corners and carries the dome. When viewed from the front, the dome drum and the buttresses supporting it can be seen (Isik and Halifeoglu, 2019).

It is known from the foundation certificate-charter that the Ali Pasha Mosque, located in the city centre of Tokat, was built during the reign of Selim II in 1572-1573. Although the name of Ali Pasha is mentioned in one of the inscriptions of the tombs next to the mosque, there is no clear information about the identity of Ali Pasha (Eyice, 1989). As can be seen from the plan, the piers protruding from the main walls formed three deep niches opening to the sanctuary with large arches and two deep niches on the northern wall, and the dome supported by squinches from four corners was carried by forming an octagonal dome base on the dome drum. When viewed from the front, the dome drum and the buttresses supporting the drum can be seen.

The Tekirdag Rustem Pasha Mosque was built in 1553, for the grand vizier of Suleiman the Magnificent, Rustem Pasha, when he was still alive (Kuban, 1988). The dome of the

Table III Octagonal based central domes carried with pillars protruding from the main walls

	PLAN	SECTION	REALIZATION
Silivrikapi Hadim Ibrahim Pasha Mosque Sources: – Ülgen, 1939 Plate 157 – Ülgen, 1939 Plate 158 – https://www.flickr.com/photos/sinandogan/5277933281			
Halep Dukaginzade Mosque Sources: – Necipoğlu, 2005 – Necipoğlu, 2005 – https://tr.wikipedia.org/wiki/Dukaginz%C3%A2de_Mehmet_Pa%C5%9Fa_Camii#/media/Dosya:Flickr_-_Eusebius@Commons_-_Al-Adiliyah_mosque.jpg			
Diyarbakir Behram Pasha Mosque Sources: – Ülgen, 1950 Plate 173 – Ülgen, 1950 Plate 174 – https://www.kulturportali.gov.tr/turkiye/diyarbakir/gezilecekyer/behram-pasa-cam			
Tokat Ali Pasha Mosque Sources: – Uysal: 347 – Tokat Directorate General of – Foundations Archive https://www.kulturportali.gov.tr/turkiye/tokat/kulturenvanteri/ali-pasa-camii-ve-turbesi			
Tekirdag Rustem Pasha Mosque Sources: – Ülgen, Plate 24 – Ülgen, Plate 25 – https://www.flickr.com/photos/sinandogan/5522580682			

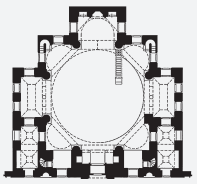
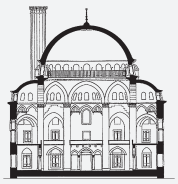
building, which rests on an octagonal base, is supported by three sliced squinches at the corners. There is a *mihrab* between the two piers carrying the dome in the south. When viewed from the front, the dome drum and buttresses are visible.

Octagonal Based Central Domes Carried by Main Walls and Supported by the *Mahfil* (Interior Loggia)

The Nisanci Mehmet Pasha Mosque is given as the only example of this group. The mosque is the last example of Ottoman Mosque architecture bearing a central dome with an octagonal plan. It was built in Istanbul, in Fatih-Karagumruk, between 1584 and 1588, according to its inscription (Yavas, 1988). Its constructor, Nisanci Mehmet Pasha, is one of the dome viziers of the Murat III reign, and since it is also known by the nicknames "Cedid" (order) and "Painted," the structure written with these names in some sources is mentioned as the work of Architect Davut Agha in *Tuhfetu'l-mi'marin*, and yet the structure is associated with Sinan the Architect (Sonmez, 1988). Within the scope of this article, sources claim that this work, which is accepted as Sinan's structure, has no relation to him (Kuran, 1988) because the plan goes beyond the patterns and incorporates new interpretations in terms of architecture (Kuban, 2011).

The building is an unusual example of the mosque type with an octagonal plan and a central dome. The main dome with a diameter of 14.20 meters supported by semi-domes in its four corners and front of the *mihrab* was supported by *mahfils* (interior loggias), thus expanding the space, and creating a cruciform plan. The transition to the half domes in the side spaces is provided by stalactite protrusions. Other side spaces are covered with vaults.

Table IV Octagonal based central domes carried main walls and supported by the *mahfil* (interior loggia used as gathering place)

	PLAN	SECTION	REALIZATION
Nisanci Mehmet Pasha Mosque Sources: – Ülgen, 1944 Plate 188 – Ülgen, 1944 Plate 191 – https://tr.wikipedia.org/wiki/Ni%C5%9Fanc%C4%B1_Mehmet_Pa%C5%9Fa_Camii			

Although the pillars carrying the dome are integrated with the main walls, their traces can be seen in the interior. While the example of the operation of the canopy system is visible here, the existence of two intertwined load transfer rings cannot be observed due to the definition of the system. However, it can be seen from the cross-section drawing of the structure that the half dome on the east-west and south walls helps to transfer the load of the main dome. The effect of the central space is strong because the side *mahfils* (interior loggias) are covered with mirrored vaults on the lower floor and a dome on the upper floor is planned as floors. The cruciform stance in planning is also reflected in the effect of the facade. Eight weight towers support the dome. The gradation on the facade made it possible to observe the effect of the central dome from the facade (Table IV).

Octagonal Central Domes Carried with Pilpaye (massive free-standing pillar inside a mosque; octagonal canopy dome structure)

As can be seen from his structures, the use of the dome in Sinan the Architect's architectural design constitutes the essence of the design (Benian, 2011). The shape used is hemispherical, and the cross-sectional curve of the dome is a circular arc. This situation required additional measures to be taken because it supported the lateral expansion of the dome and required vertical carriers for the vertical transfer of loads (Camlibel, 1998). Since the dome needed to be supported along the abutment boundaries at the fulcrum points for load transmission, Sinan the Architect used this situation to provide natural light to the interior, placing the dome on a shallow drum attached to its supports, thus making the installation rigid. This shallow drum carrying the dome, in the form of a circular, square, or polygonal base (Hasol, 1993), is made by enlarging the support section of the dome and forming arches connecting the pillars in this section. The windows that provide light to the space are positioned in these arch series. The shallow drum is supported by the buttresses. The buttresses attached to the base of the dome increase the strength of the dome in the diagonal and axial directions. As seen in Fig. 9, these buttresses support the dome against earthquake and wind loads, which are dangerous lateral forces for the structure (Camlibel, 1998). When examining Gothic-era buildings that have survived to the present day, we see the use of buttresses to support the structure of the building with an intensity that affects the design of the facade. Buttresses are likewise prevalent in the domed buildings of the Classical Ottoman Period.

Weight towers were built to meet the thrust of the main arches carrying the dome and the dome (Fig. 9). These towers are located at the junction of the pillars carrying the main dome, the suspension arches, and the pendentives or squinches; providing the transition to the dome, they are generally covered with a dome, are made from the stone as the pillar, and have a cylindrical or polygonal ground plan. According to Eyice the heavy towers, which are used to protect the dome due to their weight and especially against the loads that would arise from earthquake activity, have three basic functions: static, aesthetic, and use as stairs or passages (Eyice, 1988b).

Before proceeding further on the subject by opening a new sub-heading in the classification made, it should be emphasized that the canopy system, which is the load transfer principle used by Sinan the Architect in the central dome construction method, was an intermediate element and innovation in the transition from a masonry structure to a skeleton structure, which was applied within the limitations of the traditional construction systems of the period (Kuban, 2011). This is an innovation in the transition from masonry to skeleton structure in Islamic architecture and it is as important an innovation as earlier innovations in Islamic architecture, notably the ribbed structures in the north dome of the Juma Mosque in Isfahan and Gothic structures such as the Reims Cathedral.

Masonry domes, which generally unravel outwards, tend to open more when they are built

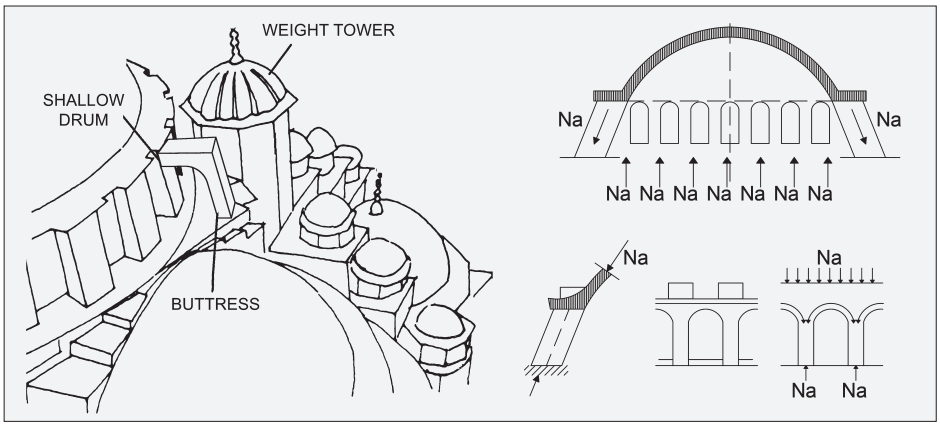
with low domes, especially as in the Hagia Sophia Mosque. One of the outstanding problems the designer faced with the large-span dome was that the masonry material used created quite a heavy mass. The setup called the canopy system, developed by Sinan the Architect in his attempts to cover a wide opening with a central single dome, works according to the principle of transferring the loads to two nested rings (Kuban, 1987). Therefore, the structural load of the dome, which is desired to be made higher and wider each time, is distributed to the entire structure, thus fulfilling the load transfer principles. During this distribution, the vertical carriers, and the corner wall, in addition to the wall buttress, the arch, and buttresses allow the horizontal transfer of loads (Fig. 7). The buttresses added to the structure, as in the Kilic Ali Pasha Mosque; to avoid any damage that might occur in the structure while transferring the load of the dome to the ground, the weight towers positioned next to the dome and the shallow drum can be considered Sinan the Architect gifts to the structural systems of his age in transferring the load of the structure to the ground (Tuluk, 1999, 2006).

In Figure 10, on the left, the black area shows the load distribution from the dome resting on the octagonal base through the arches in the first ring of the canopy, and the white frame shows the second ring in the load distribution. In the picture on the right, black arrows describe the transfer of the load to the main walls, the second ring of the canopy, with the arch and buttresses in the first ring.

According to the canopy system, the secondary elements surrounding the first ring are connected by arches and buttresses (Fig. 10). The outer shell surrounds the inner shell, depends on it, and supports it but does not seem to be attached to it. In this way, the load of the dome does not fall on the walls, but the load of the structure descends to the ground in stages with the arch-pier system created. This frees the interior from unnecessary walls, thus not only creating an uninterrupted space but also significantly increasing the natural lighting in the interior. This group of mosques is listed chronologically as the Tahtakale Rustem Pasha Mosque (1561), the Edirne Selimiye Mosque (1574), the Azapkapi Sokollu Mosque (1578), and the Mesih (Mahdi) Ali Pasha Mosque (1586). In this study, grouping was made according to the way the domes are transported over the canopy system and the number of pillars as explained below.

Four Pillars in the Middle and Four Pillars on the Wall Type

The plan section and views of the Tahtakale Rustem Pasha Mosque and the Istanbul Mesih Mehmet Pasha Mosque, which are included in this group, are given in Table V.



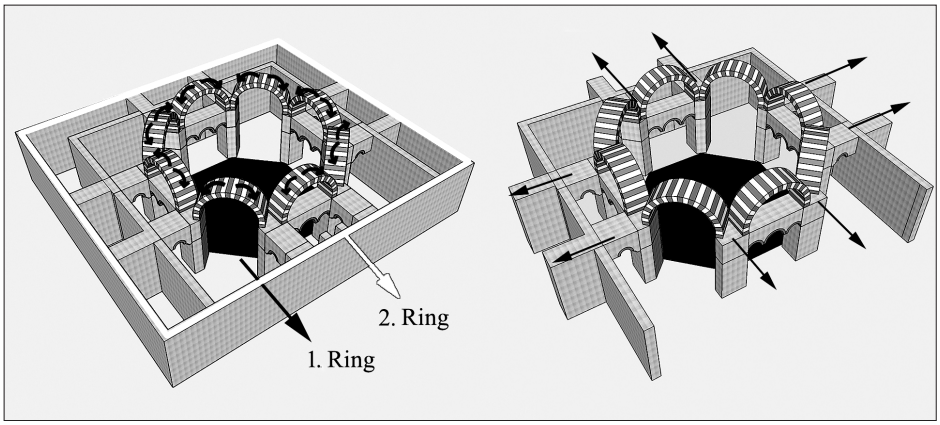


Fig. 9 Representation of the singular and distributed forces (Na) in the dome with the shallow drum, weight tower and buttress arrangements used to provide load transmission in the domes note: "Na" represents the distributed load on the building elements

Fig. 10 Working principle of the canopy system in octagonal based central dome while transferring structural loads

The Tahtakale Rustem Pasha Mosque, located in Istanbul Province, Eminonu District, Tahtakale Nalburlar District, was built on the land of Haci Halil Aga Masjid, which was converted from an old Byzantine church in the 15th century (Oz, 1987). Although the building does not have an inscription, its completion date is accepted as 1561. The owner of the building was Rustem Pasha, the son-in-law of Suleiman the Magnificent (Kucuk, 2020).

The exterior view of the building describes the horizontal development trend in planning. It is seen that the pillars carrying the dome were rescued from the main walls in east-west directions and positioned as four legs in the interior. This is the first application made in mosques with octagonal bases and central domes. Supporting the four pillars left in the middle with the side spaces led the building plan to a rectangle measuring 26.80×19.60 meters (Kucuk, 2020). The other pillars take the load together with the main walls. The borders of the galleries on both sides of the building are defined by the outer main walls and internally by the pillars bearing the load of the dome and three columns aligned with

TABLE V MOSQUES IN THE GROUP DESCRIBED AS FOUR PILLARS IN THE MIDDLE AND FOUR PILLARS ON THE WALL AND THE REPRESENTATION OF THE CANOPY SCHEME ON THE PLAN

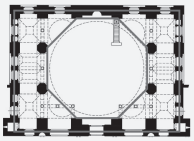
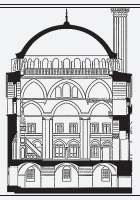
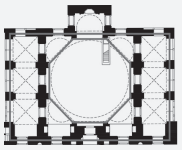
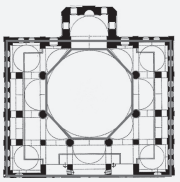
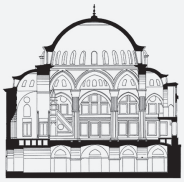
	PLAN	SECTION	REALIZATION
Tahtakale Rustem Pasha Mosque Sources: – Ülgen, Plate 66 – Ülgen, Plate 69 – https://www.shutterstock.com/tr/image-photo/istanbul-turkey-august-22-2008-mosque-1726807543			
Istanbul Mesih Mehmet Pasha Mosque Sources: – Ülgen, Plate 182 – Ülgen, Plate 184 – https://istanbultarihi.ist/305-xvi-xvii-yuzyil-istanbul-mimarisi#gallery-33			

TABLE VI MOSQUE IN THE GROUP IS DEFINED AS HAVING SIX PILLARS IN THE MIDDLE AND TWO PILLARS ON THE WALL TYPE AND THE REPRESENTATION OF THE CANOPY SCHEME IN THE PLAN

	PLAN	SECTION	REALIZATION
Azapkapi Sokullu Mehmet Pasha Mosque Sources: – Ülgen, 1941 Plate 179 – Ülgen, 1943 Plate 180 – https://www.tripadvisor.com.tr/LocationPhotoDirectLink-g293974-d15144857-i485711643-Sokollu_Mehmet_Pasa_Camii_AzapkapI-Istanbul.html			

these pillars. Due to the low arrangement of the mirrored vaulted side galleries, they are perceived in the interior, while the side galleries do not join the square space in the middle, and the central space setup is not altered in perception. While the weight of the dome is transferred to the four pillars in the middle with pointed arches and to the main walls in the north-south directions, the possibility of the first attempt at canopy construction comes to mind. There was no need to use buttresses to support the dome structure whereas the dome drum was supported by arched buttresses from eight points.

During the transition to the 22.80-meter-high dome, the octagonal configuration resulted in the creation of darker spaces in the arches situated in the remaining corners of the octagon. This phenomenon occurred due to the acoustical reflections within the squinches present in these corners; this situation allowed the corners to be felt less and the octagon to be perceived better. As seen in Table V, the arches meet the horizontal forces of the dome load through the primary arches.

With these features and plans, the building is the first example where the octagonal setup can be observed both in the interior and in the facade design. Although it was observed that the dome interpretation applied by Sinan the Architect of this building was repeated in the Yeni Valide Mosque, which was dated between 1708 and 1710, with different measures and without bringing any innovation, no other repetitions could be detected apart from this example.

According to the building epitaph discovered in Fatih, Istanbul, the Mesih Mehmet Pasha Mosque was completed in 1585-1586 (Acar, 1992). The building is registered in *Tuhfetu'l-mi'marîn*. In *Tezkiretu'l-bunyan* (Sinan the Architect's autobiography), there is no reference because it was not yet built when the work was written. It was added to *Tezkiretu'l-ebniye* later. Although Sinan the Architect was still the chief architect at the time of construction, he started to confer his responsibilities on Davut Agha, and in some sources, it is accepted as a construction built by Davud Agha. The builder, Mesih Mehmet Pasha, is one of the statesmen who served *Devlet-i Aliye* (Sonmez, 1988). The building is located inside the kulliye.

The half dome of the mosque in front of the *mihrab,* the first example of which we saw in Selimiye Mosque which was built about eleven years before this mosque, covers a wide area. The side galleries on the east and west wings of the central dome are covered with three cross vaults on the lower floor and

three domes on the upper floor and look outwards. Therefore, the user on the ground floor can perceive the central dome alone. Since the height of the half dome covering the *mihrab* niche and the suspension arch in this mosque is associated with the central dome, the perception of space expands towards the south. Four carriers of the central dome with a diameter of 12.85 meters are located on the north wall and two are on the *mihrab* wall. The remaining four carriers are on the side gallery walls. The dome is supported by four half-domes of equal size, and the aforementioned *mihrab* protrusion is also covered with a half-dome.

The building did not offer any innovation in facade design compared to its predecessors. The main dome, which was built with a shallow drum, has eight weight domes viewed from the front. There are no buttresses on the dome rim. The development in the form of floors inside can be observed from the front.

The canopy pattern can be observed in the plans of both mosques. The first ring of the canopy is formed by four pillars in the middle and four pillars embedded in the wall on the north and south walls, and the eight legs in the first ring are connected by arches. The second ring, on the other hand, was built with the main walls at the level of the first legs, again using arches.

Six Pillars in the Middle and Two Pillars on the Wall Type

The Sokullu Mehmet Pasha Mosque, located in Istanbul, Beyoglu-Azapkapi, was opened for worship in 1578 according to its inscription (Oz, 1987). It was built by the Grand Vizier Sokullu Mehmet Pasha on the northern shore of the Golden Horn and is the only work of Sinan the Architect that was applied in this plan type.

As can be seen in Table VI, the mosque has eight independent pillars, two of which are not separated from the walls, supporting the dome in the middle. These are connected by suspension belts. Although side galleries surrounding the central space were formed with these arches, they cannot be perceived as a single space with the main dome as the ceiling heights of the side galleries were kept low. The entrance to the building is made from the east and west facades, close to the north facade. The centralized plan cannot be perceived by the observer since the bearing pillars on the east-west main walls are taken indoors. The central dome of the building, which is approximately 11.40 meters in diameter, is supported by eight semi-domes. As can be seen from the plan, these domes are of different sizes and the ones parallel to the entrance axis to the space are the largest, the ones perpendicular to it are smaller, and the domes on the diagonal are the smallest (Sonmezer, 2003).

The octagonal-based central domes system in the Azapkapi Mosque should have been built after the Selimiye Mosque, but the realization was not successful in terms of the holistic perception of the space. Among the architectural details that cause this is the fact that the two legs adjacent to the walls in the direction of the *mihrab* are not specified separately as in the Selimiye Mosque and the entrance is made from the sides, rather than the centre.

When the facades of the mosque are examined, inconsistency with the plan and covering system draws attention. Small domes of different sizes surrounding the main dome do not show the building symmetrically on the facade, and the main dome is perceived as shifted from the centre to the south. When looking at the south side of the building, the domes at the corners are adjacent to the semi-domes on the sides, while the corner domes on the north side are far from the adjacent semi-domes. Eight weight towers on the facade supported the carriers of the dome, no buttresses were used (Table VI).

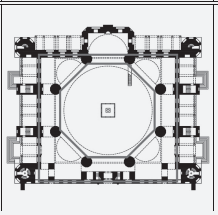
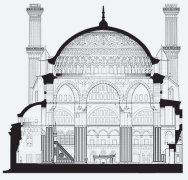
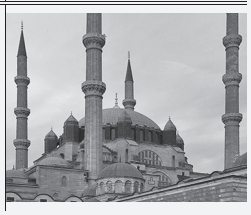
The Eyup Mosque (1798-1800), one of the last examples built in the Ottoman Period, is shown as a bad repetition of the Azapkapi Sokullu Mehmet Pasha Mosque, the last work of Sinan the Architect with a single dome based on an octagonal plan (Kuran, 1988).

Eight Pillars in the Middle Type

Selimiye Mosque, one of the most distinctive works of Islamic architectural history, represents the peak reached by classical period Ottoman architecture and in examples of mosques with octagonal-based central domes. The building in Edirne started in 1568 according to its inscription and was completed in 1574 (Sonmez, 1988). It is highly probable that the location of this building, built by Sultan Selim II, was chosen at the dominant point of Edirne, as a consequence of the hills of Istanbul being overcrowded with *selatin* (imperial) mosques, and the mosque was built in a large complex like the previous *selatin* mosques.

Sinan, the architect of the Selimiye Mosque, may have drawn inspiration from the Little Hagia Sophia Church built by Hagios and Bakkhos in the 6th century. The church is in the Kadirga District of Istanbul's historical Penin-

Table VII Plan, section, and facade view of Selimiye mosque where the eight supporting legs and canopy system can be observed in the plan and the representation of the canopy scheme in the plan

	PLAN	SECTION	REALIZATION
Edirne Selimiye Mosque Sources: – https://archives.saltresearch.org/handle/123456789/79833 – https://www.avundukmimarlik.com.tr/tr/edirne-merkez-edirne-selimiye-camii-1991/ – https://www.tripadvisor.com.tr/LocationPhotoDirectLink-g652369-d2701429-i40965891-Selimiye_Mosque-Edirne_Edirne_Province.html			

sula and features an octagonal-based central dome system. However, it is important to note that the Little Hagia Sophia Church is not the sole source of inspiration for the Selimiye Mosque's design. When comparing the two buildings, it can be noted that Selimiye Mosque is a testament to Sinan the Architect's mastery of a system foreshadowed by the 6th-century Byzantine church and accomplished through the methods of his time.

Suspension belts connecting the pillars form the first ring of the canopy system, and the second ring is formed by connecting the first ring to the main walls via belts. Although the dome load in the mosque is higher than that of the Tahtakale Rustem Pasha Mosque, the pillar sections are smaller as seen in the plans. The octagonal canopy system is most clearly seen in this structure. Six of the pillars in the space are completely independent of the main walls of the building. The two of them were built with the impression that they would break from the main walls. Canopy, instead of being the structure where the main walls and the system are intertwined, has become the shell that surrounds it and determines its boundaries (Kuran, 1988) and carries the load of the main dome from a structural point of view. A half dome was made as the upper cover of the *mihrab*. The fact that the stirrup of the arch to which this dome is attached is lower than the stirrup of the suspension arches between the pillars prevents the niche in the *mihrab* from disrupting the centralized perception of the interior. When the transition to the dome is viewed from the front, the gradation on the facade, the weight towers on the eight corners of the dome, and the buttresses supporting these towers can be seen. It is clear that every building element on the facades emphasises the centralism that was aimed to be established inside, where no structural element that could interrupt the effect of the dome which possesses symbolic value is present, shown by the vertical volume created within the interior and the perception of the facade; in other words, every building element participates in the distribution of the load and the creation of the facade and the organisation of the plan (Table VII).

Conclusion

The Ottoman Mosque architecture of the classical period holds a unique position in the history of religious building design. It embodies holistic design principles, reflected in the spatial organisation, functional building elements, construction methods, and facade silhouettes.

Based on the findings of the study, it was appropriate to categorise the eighteen mosques examined into two main groups based on their implementation or lack of a canopy system. Further subdivisions were made within these categories based on the method they employed load transfer in the dome. Sketch plan drawings were created for each classification.

In the initial group, a canopy system is absent, and the dome's load is supported by the primary walls and buttresses in the design. However, the use of shallow drums and buttresses cannot be determined solely based on section drawings regarding the dome structure. Such drawings merely present a three-dimensional architectural structure. From the analysis of the vertical projected architectural plan (i.e. sections) and the corresponding tables presented in this article, it is evident that the load-bearing system in the dome utilises shallow drums and struts.

In the second group, the dome load transfer is facilitated through the canopy system. In

addition to the dome shallow drum and buttresses, a weight tower is used to support the construction in the section (Table VIII).

In Table VIII, the thick lines describe the main walls/piers/side galleries and piers of the building, which are responsible for carrying the dome. The thin lines represent the trace of the dome resting on the octagonal base, and the dashed lines describe the arches used in the load bearing system.

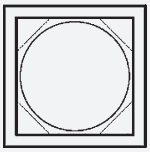
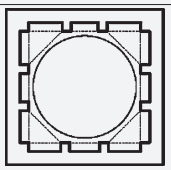
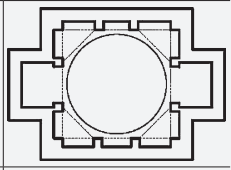
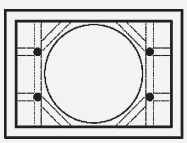
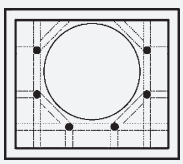
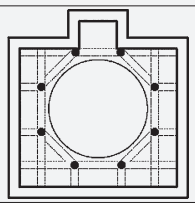
To support the majestic and heavy construction setup of the building, the use of gravity towers in the dome was observed in the Mesih Mehmet Pasha and Azapkapi Sokullu Mosques, and the use of buttresses in the dome was observed in the Tahtakale Rustem Pasha Mosque. In the Selimiye Mosque, both buttresses and weight towers were used to support the dome. Weight towers, as structural elements that are built to withstand the opening forces of the monumental-sized dome-like Selimiye Mosque, give more weight to the carrier legs of the building and enable the construction to be viewed from the front. At the same time, arched buttresses strengthen the constructive expression on the facade.

The construction of the suspension arches supporting the load-bearing system in these structures as two-centre pointed arches was applied continuously in all examples, starting with Sinan the Architect's first octagonal base mosque, the Hadim Ibrahim Pasha Mosque.

Classical Ottoman Mosque architecture holds a prominent position in architectural history, thanks to the contributions of Sinan the Architect. Especially in mosque design, Sinan excelled in central space planning, functional use of building elements, and design of large spaces. Among the central domed mosques on octagonal bases studied, the Selimiye Mosque stands out as a singular example of excellence. In buildings constructed using the canopy system, the system's load transfer advantages provide desired openings while allowing for the integration of interior space with visual and physical comfort, resulting in a balanced facade.

Sinan the Architect's creativity, combined with the construction technology and the level of architectural sophistication of his time, resulted in the works of the Ottoman Mosque architecture that are structurally unique. Davut Aga, who assumed the position of chief architect after Sinan the Architect, also produced original works, although about 150 years later octagonal-based central domes were built. New Valide Mosque (1708-1710), Laleli Mosque (1759-1763), and Eyup Mosque, built at the beginning of the 19th century were only repetitions of this type compared to the mosques of the classical period, therefore, no structural innovation could be made. Consequently, the mosques that are the subject of this article hold special importance in the history of Islamic architecture.

Table VIII Plan typology octagonal based central domes

Group 1: Octagonal Based Central Domes Carried by the Main Walls	**Octagonal based central domes carried only by the main walls**	**Octagonal based central domes carried with pillars protruding from the main walls**	**Octagonal based central domes carried main walls and supported by the *mahfil* (interior loggia)**
			
	– The Uskudar Semsi Ahmet Pasha Mosque (1580) – The Izmit Pertev Pasha Mosque (1572-79) – The Istanbul Haseki Sultan Mosque (1538-51) – The Ankara Cenabi Ahmet Pasha Mosque (1566) – The Mostar Karagoz (Sofu/Pilgrim) Mosque (1557-58) – The Van Husrev Pasha Mosque (1567) – The Edirne Defterdar Mustafa Pasha Mosque (1576) – The Diyarbakir Iskender Pasha Mosque (1551)	– The Silivrikapi Hadim Ibrahim Pasha Mosque (1551) – The Aleppo Dukaginzade Mosque (1556-66) – The Diyarbakir Behram Pasha Mosque (1564-73) – The Tokat Ali Pasha Mosque (1572-73) – The Tekirdag Rustem Pasha Mosque (1553)	– The Nisanci (Marksman) Mehmet Pasha Mosque (1584-88)
Group 2: Octagonal Based Central Domes Carried with *Pilpaye* (massive free-standing pillar inside a mosque) (octagonal canopy dome structure)	**Four pillars in the middle and four pillars on the wall type**	**Six pillars in the middle and two pillars on the wall type**	**Eight pillars in the middle type**
			
	– The Tahtakale Rustem Pasha Mosque (1561) – The Istanbul Mesih Mehmet Pasha Mosque (1585-86)	– The Azapkapi Sokullu Mehmet Pasha Mosque (1578)	– The Edirne Selimiye Mosque (1568-74)

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Sources of illustrations and tables

Fig. 1	Kuban, 1987
Fig. 2	Coruhlu, 2000
Fig. 3	Eyice, 1993
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Fig. 10	Images produced by the authors
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Both authors contributed equally to all phases of the article, including conceptualization, methodology, validation, formal analysis, investigation, sources, data editing, writing – original drafting, writing – review and editing, visualization, and supervision. All authors have read and accepted the published version of the article.