

# Studying Mistaken Theory of Calendar Function of Iran's Cross-Vaults

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**Abstract**—After presenting the theory of calendar function of Iran's cross-vaults especially "Niasar" cross-vault in recent years, there has been lots of doubts and uncertainty about this theory by astrologists and archaeologists. According to this theory "Niasar cross-vault and other cross-vaults of Iran has calendar function and are constructed in a way that sunrise and sunset can be seen from one of its openings in the beginning and middle of each season of year". But, mentioning historical documentaries we conclude here that the theory of calendar function of Iran's cross-vaults does not have any strong basis and individual cross-vaults had only religious function in Iran.

**Keywords**—cross-vault, fire temple, Calendar function, Sassanid period

## I. INTRODUCTION

THE document theory of "calendar function of Iran's cross-vaults" is a wrong theory introduced by some interested in astronomy in recent years and this has caused some doubts and uncertainties among researchers of astronomy and archaeologists but except some distracted ideas, there has not been any precise study to reject this theory. Using historical documentaries and referring to them both in literature and architecture history, in this article it will be concluded that; this theory has no exact or detailed basis. The goal of this research is to reject the theory of calendar function of cross-vaults and to prove that all individual and non-individual cross-vaults had religious function in Iran. Paste Special | Picture (with "Float over text" unchecked).

## II. BASICS OF THE THEORY OF CALENDAR FUNCTION OF CROSS-VAULTS

In the formation and setting the basis for the theory of calendar function of cross-vaults, the theorist emphasizes the below issues which come with lots of mistakes and incorrectness.

### A. Being Distant From Residential Places

Some cross-vaults are not in the middle or even suburbs of cities and villages and are built on mountains and far-away plains distant from residential places. This shows that they could not have religious function.

### B. Not Existing Fire Room Around Cross-Vaults

Architectural structure of cross-vaults cannot prevent from sun shine, wind, rain and other pollutants to affect fire and till this day no fire room or even the remains of such room is found around cross-vaults to call them fire temples.

### C. Conformity Of Cross-Vaults' Proportions With Inclined Angle Of Sun

The proportion of "base width" to "length of each side" of cross-vault, which is a fixed proportion of 1 to 2.3 to 3.9 makes 23.5 degree arch between the edges of bases and the visual line created of it which is equal to inclining edge of sun. Therefore, by observing sun from the mentioned angles the spring and autumn equinox and winter and summer turn can be known[1].

## III. SIGNS OF RELIGIOUS USES OF IRAN'S CROSS-VAULTS

Different signs can be found to show the cross-vaults in different places of Iran were fire temples, some of which are mentioned below.

### A. "Ferdosi's Shahnameh"

Among the signs in traditional literature is a documentary explanation of "Ferdosi" in "Shahnameh" about "Azar Goshnasb" fire temple. Here are the characteristics of fire temple as Ferdosi explains it:

- Fire temple construction is inside the castle
- "Tall vaults" are constructed around the temple and far from it: the buildings that were made special for affairs other than praying to God.
- Its horizontal cut (its plan) near the ground had square shape with equal length and width.
- A dome is constructed on the square plan. The height of this dome was the highest possible dome height at that time.

Therefore, according to Ferdosi and based on our conclusion "Azar Goshnasb" fire temple is in fact just a "cross-vault"[2].

### B. Mark Of Stamp Of High Priest Of The Zoroastrian Of "Azar Goshnasb" Fire Temple

From the mark of the stamp which belonged to high priest of Zoroastrian in "Azar Goshnasb" fire temple on most of mud pieces, the first written document to find out the place of well-known "Azar Goshnasb" fire temple on "Takhte Jamshid" is acquired. This finding is a suitable documentary from 6<sup>th</sup> century to conform to the place of "Shiz" with "Takht"[3].



از مهر ویدوییدان آتشکده آذرگشنسب

Fig.1 Mark of stamp of high priest of the Zoroastrian of "Azar Goshnasb" fire temple which is found during the excavation of Sassanid layer of "Takhte soleiman"

Construction of cross-vault at Sassanid period was so in accord with the concept of “fire temple” that was equal to it and it was driven to the inside of structural space of the Iranian temples day by day as though got dissolved in it. “cross-vault” has four bases which can be symbol of four elements creating universe. The four doors or entrances of it open to four directions referring to four side of world. Its square shape plan on ground is symbol of earth and its stability and the dome shape of its roof is symbol of sky.

A lot of evidence is found in “Shahnameh Ferdosi” concerning the conformity of architectural form of “cross-vault” with a religious place. The terms “Gonbad-e-Azar” and “Gonbad” on “Azar” (fire) reminds us of the flame burning on top of the dome at the heart of “cross-vault”. The spatial shape of “cross-vault” was built in a way that the movement of the people surrounding and around the fire could be performed in two ways during holding the religious ceremonies:

- The individuals were turning around its center inside the “cross-vault” space.
- The individuals were turning around the fire outside “cross-vault” space.

In some cases, the latter movement had “cross-vault” space placed inside another space which often had a square plan.

#### C. Fire Temple Of “Khaje Sistan” Mountain

A basic example of the space inside a fire temple with its relevant “cross-vault” could be seen in mud brick fire temple in “Khaje Sistan” Mountain. Here, we are faced with a mud brick “cross-vault” around whose dome-house is surrounded by a hall; such an structure does not only separate the place from the polluted surrounding spaces but it also makes it possible for the worshippers to move and go around. This hall, in its turn, is connected to an enclosed and protected room through a door. “Hertsfeld” has found a stone fire place in this area during one of his excavations[4].

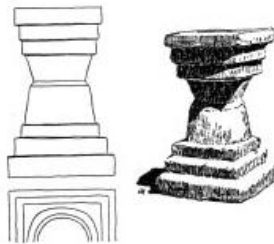


Fig.2 The base of stone fire-holder found in cross-vault of “Khaje” Mountain fire-temple

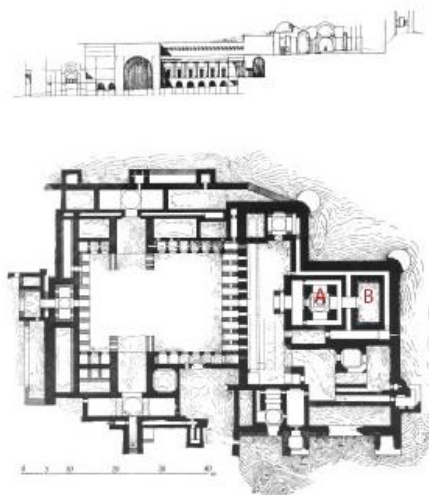


Fig.3 Plan and vertical section of the fire-temple in the mountain

#### IV. STUDYING THE THEORY OF CALENDAR FUNCTION OF CROSS-VAULTS

##### A. Studying why they are far from residential areas

Location of a “cross-vault” in a region far from residence could, by itself, be a reason to reject the idea of its calendar function as well as observatory, however, it can’t decline its religious function. Several example of such religious recluse can be mentioned both in the architectural shape of fire-temples in pre-Islamic period and in architectural shape of shrines in Islamic period in Iran. For instance “Mohammadteghi Mostafavi” gives the directions of “cross-vault” monument belonging to the fire-temple “Faraz Mara Avar Khodaya”, believing it is located along “Bala Deh” route toward “Sar Mashhad” in a region called “Sarreh” in Fars, which is far from either urban or rural residential areas, having a very hard accessible and totally mountainous route. The location of this monument on top of the highlands and its being dedicated to “Mehr Nersi” all imply the fact that the above mentioned minister had built this monument on a remote high place, far from the crowd and their noise in order to worship and pray God [5].

Also there is another famous case which has been equally quoted by “Ibne-Esfandyar” (in “Tabarestan” history), “Zahir-al-dine-Marashi” (in “Tabarestan” history and “Royan” and “Mazandaran”) concerning “Bav’s” being hermit (who was the head of “Al-barand” in “Mazandaran”) during two different time periods and his being recluse and living far from the people inside a fire-temple built by his great-grandfather on the mountains [6].

Furthermore, there is at least some firm news in Elamite dynasty about “Beite-Akito” or a religious place far from the city or any villages in such a way that its surroundings was open as far as possible. It was a place where the prayers used to go there at times, took the statues of their Gods to the mentioned place; and consequently returned them to the city temple having completed the rituals. “Roman Grisham” points to this issue in his second volume of “Choghazanbil” believing that in Sassanid dynasty and regarding the thinking

background of Elmite and Mazda and also Hakhamanesh dynasty, there was religious rituals of transferring sacred fire from fire-holders of the villages and cities to a place out of city in which majority of people from cities or villages were present in such religious ceremonies and parties, and then sitting on the throne was performed transiently under the cross-vault, and finally, following the accomplishment of the religious ceremony, fire was taken again from cross-vault and returned to the fire-holders of the cities or villages [7].

In other words, cross-vault at the center of a vast area represented the center of worship and symbolized unity. One example is the function of a cross-vault built by "Persians" in 18<sup>th</sup> century on the border of Baku, known as Baku fire-temple which is obviously showing its usage. Also, some foot-prints of Grisham's theory could be found in Islamic period and that is the description which the muslims provide from the terms "Eidgah" or "Mosalla": the area surrounded outside the city in which some excellent parayers are held regarding the occasions of two great ceremonies called "Fetr" and "Gorban".

Another famous theory concerning some of the cross-vaults' being far from the villages and their function is the same idea that "Andrea Gudar" and "Maxim Siro" and following them some of the other researchers focus on: "these monuments were signing or marking fire-temples and were located on the important historical and archeological routes."

"Gudar" and "Siro" in their book "Iran's works" bring about some examples like the monuments "Ghaleye-dokhtar" (the girl's temple) in Gom located on top of the hills overlooking Gom-Arak Road, and "Ghaleye-dokhtar" in Shahrestank located on top of the high mountain on the common border of Ahar and Shahrestanak in north of Tehran, and they, then, focus that the sacred fire-temple was lit during the hours of worshipping and saying prayers, showing the route to the passengers as well [8]

Mohammad Karim Pirnia gives attention to this idea too, however, with such a consideration he blames the religious extension on cross-vault monuments [9].

In "Ferdosi's Shahnameh" one comes across some cases in which it was said, clearly, that some marking monuments and domes were to be built outside the city overlooking the main route.

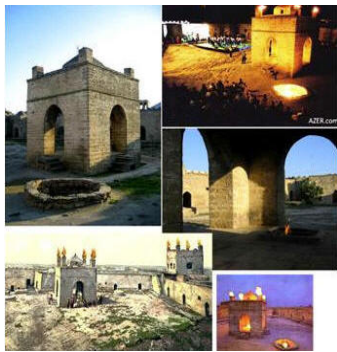


Fig.4 Some images of the cross-vault in a fire-temple located in Baku, it lies at the center of a vast yard allowing plenty of people gather around it.



Fig.5 A view of "Gal-e-ye-dokhtar" (girl's castle) in Shahrestanak

Also, Mohammad Taghi Mostafavi came to the conclusion while he was carrying out very accurate historical studies on the cross-vaults of an area called "Save" in Fars (southeast of Kazeroun). He believes the famous cross-vaults "Save", "Tun-e-sabz" and "Farashband" were located on a very old and historic route taking "Estakhr" to "Fahliyan". Moreover, as it has been quoted from Tabari (Mohammad ibn-e-jarire-Tabari, 226-310 lunar calendar) in his book "Tarikh-e-rusul va muluk" (history of prophets and kings) (Tabari History), these cross-vaults were known as fire-temples established by "Mehr Nersi". Quoting from Ahad Kateb (late 9<sup>th</sup> century lunar calendar) in his book "Yazd's memorial", another historical point must be noted here concerning the reason of construction of some cross-vaults and fire-temples in places far and remote from the view of people: [following Islam's overcoming, "Atash bahram" was taken to a village 3 km away from "Ogda", and preserved there, it was, then taken to "Tork Abad" near "Ardakan" and after that it was returned to a place called "Ashkoft-e-Yazdan" on the mountains of "Ogda" and kept there for a long time].

Preserving fire far away from villages and public residential areas used to be a way of guarding religion which was being endangered. If one would read the following quotation from "Estakhri" in "Almasalek-va-Almamlek" in the memory of "fire-temples of Fars": [no villages or areas are with fire temples], then the duty of guarding the fire in all these fire-holders is clear, in a similar way of "Yazd" where the Zoroastrians have been always loyal to their old religion in spite of the fact that oppression and dangers threatened their community. Another clamorous theory brought about solitariness of the cross-vaults outside the cities and villages implies that they were tombs. That is in an opposition against inside burial chambers "Khorshid Negaresh" the stone tombs of Sassanid dynasty and various Ashkanid and hakhamanesh graves have been pinpointed, and as a result "the solitary cross-vault outside the village" has been symbolized as a tomb over the dead body or bodies that have been placed over a level of stones in or under the cross-vault [10].

This theory has been discussed very seriously in the book "Islamic Architecture" by Robert Hilien Brand (the professor

of Islamic Arts in Edinburg’s University) [11]. This theory is a reminder of grave yards called “Gabri” which is also named “Gabar Gur” in north, and they have been scattered on top of the most historical hills. It is a form of burying the dead body in the burial chamber in which lying the body is performed over a stone surface and a reverting around it with stones.

Ms. “Nasim Alipour” in her book “Dadgahe Cham” has given interesting research concerning the rituals of putting the dead body in burial chamber. Therefore, according to the Zoroastrians’ belief that the spirit of the individual passing away in past remains around his body until three days and it leaves the body on the morning of the fourth day, a “Borje Fanous (lantern tower)” or a building with upper platforms which was the place of lighting fire, (with oil and not firewood) was built in the distance of 200 to 300 meters (this is the radius preventing pollution from getting to fire) away from the burial chamber (outside the cities and villages). “Dakhme Ban” (a person in charge of the chambers) was obliged to light the fire of the lantern inside the tower every night. Therefore, this “lantern tower” did not only act like a “guiding mile”, according to religion, fire’s light kept away death and loneliness from the spirit of the dead or deads [12].

In his book “Isfahan’s fire-holders” “Yaghish Kazemi” gives a brief description from “Williams Jackson” (during his visit from the burial chamber in “Rey”) about the term “Shegari” meaning “cham” and also a place a little far from the dead bodies’ graves where the light of fire or the lantern should always be on there. Even now that the Zoroastrians community of Iran has admitted the burial method (the coffin around which is covered with stone and cement), a light is kept on for three days and nights in the very place in which the dead body stayed in his house before dying, and a message behind the night must be prayed by one of the dead body’s relatives every night.

With a little care footprints and traces of this ancient belief could be found in the candles lit in shrines (the shrines of Imams’ descendants). Even now, in some Bakhtiary and Kordestan villages it is common to light fire beside the grave of a dead body during the first night of his passing away; with implication that the spirit of a dead body is frightened of darkness. Having these descriptions, one reasonable estimate is to find an old grave or a graveyard in the radius of 200 to 300 meter from the solitary cross-vaults located in the remote points of the cities and villages. The minimum distance between a corpse and a holy clean thing has been mentioned to be 30 feet.



Fig.6 A monument of an anonymous tomb on top of a hill in the region of “Samiran” in Gazvin

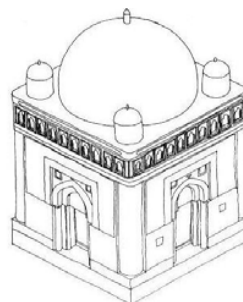


Fig.7 A monument of the cross-vault form known as “Samanid tomb” in “Bokhara”.

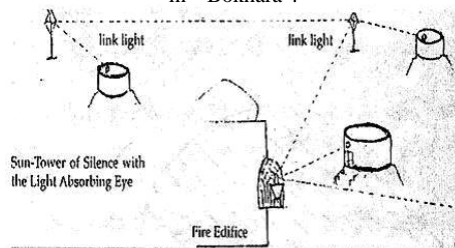


Fig.8 An image showing how light of fire from “Borje-Fanus” cast into the hole devised on the wall of Zoroastrian’s tomb



Fig. 9 “Asvan”, the monuments of the cross-vault of anonymous martyrs’ tomb remaining from Fatemi period outside the city



Fig.10 “Borje-Fanus” building at 200 m from the mountain foot-Zoroastrians’ tomb, “Cham”, a village in Yazd

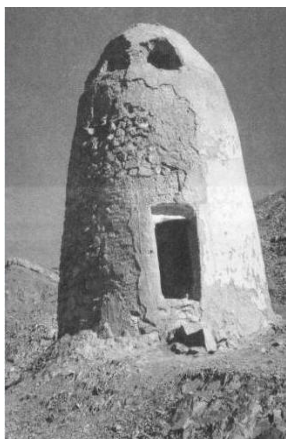


Fig.11 The solitary cross-vault overlooking the old graveyard “Zagh” (a village in southeast of “Duzeh” in Fars)

*B.A Study Concerning The Lack Of Fire-Room Around Cross-Vaults*

It is true that a cross-vault’s architecture should prevent sun’s ray, wind, rain and pollution to the fire flames, pointing to a Mazdaism customs in which the light from the sun should not cast over fire directly, because fire would be poorer; likewise, fire must be kept away from any pollution or pollutant. But the second part of this statement is incorrect containing a lot of controversial examples. Yaghish Kazemi in his article Mehrin-e-Esfahan tries to deal with this incorrect statement briefly [13]. In this article, an undamaged example of a set of cross-vaults with an enclosed and roofed room far from the purpose of keeping fire beside it is mentioned, which is located in 20 km south of Rastag (Darab in Fars) known as “gasre-dokhtar” (girl’s castle) cross-vault.

In the article mentioned, some similar cases of the cross-vault of the village Dah Sheikh (Dast-ab in Kerman) are given as examples, and of course, plenty of other various cases could be brought about as examples.

Among these, are some examples of “cross-vaults with a hall for preserving fire and the spaces connected to the entrance side, which could have been changed to porches if they had been roofed”. The combination of cross-vault and porch is considered one of the ever-lasting combinations of art in Iran, which stands beautifully on architecture of mosques in Islamic period. The cross-vault “Kerateh” or “Keradeh” in northwest of “Duzeh” located in Fars (overlooking Meymand-Jordan border) is one of these kinds. And another case which should be given attention to is a monument known as Espakh fire-temple in northern Khorasan lying on Bojnourd and Golestan route on west side of Ashkhaneh on top of a high hill beside Espakhu village.

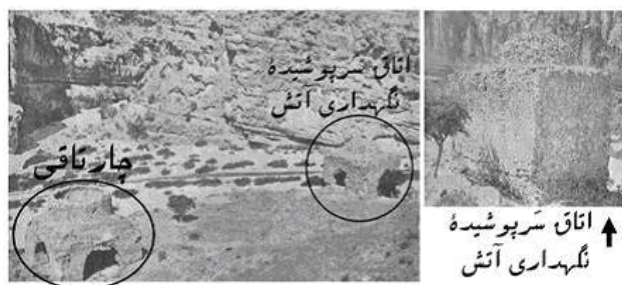


Fig.12 Cross-vault “Gasr-e-dokhtar” (girl’s castle) (Rastag district in Darab, Fars-Rastag to Forg route)

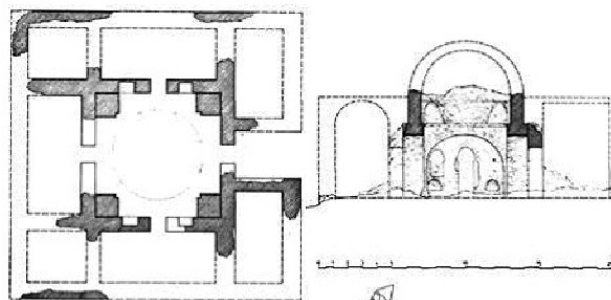


Fig.13 Plan and the cross-section of cross-vault “Kerateh” (northwest of “Duzeh” in Fars)



Fig.14 Cross-vault of the village “Dah Sheikh” (“Dasht-e-Ab/Baft district/Sirjan, a city in Kerman)

And another evident example of this kind is a monument known as Chaahr Gapu located in Gasre Shirin in Kermanshah province, unfortunately few things remain from the whole monument; however, with the help of the images and archeological reports carried out before, it can be introduced as a private fire-temple beside the glorious palace of Khosroparviz.



Fig.15 “Dome” and “porch” of a monument known as “Espakhu fire-temple” (Bojnurd-Golestan route)

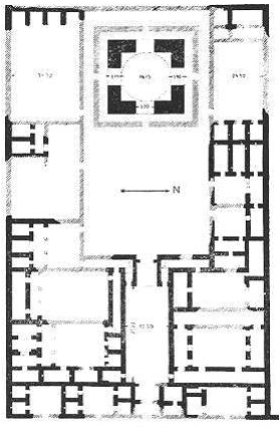


Fig.16 Plan of the fire-temple near KHosroparviz's palace known as “Chahargapu” in Gasre Shirin

There are also other examples of “cross-vaults with the halls preserving fire and central yard with the rooms surrounding it” like the cross-vaults of “Konar Siyah” collection (30 km from south Firuz Abad in Fars). Here, we are encountered with a much more complete model than the above-mentioned cross-vaults known as “Gasre Dokhtar”.

The holy fire was kept inside the enclosed and covered dome-like space A (enclosed cross-vault). This is the very place called the fire-temple of the collection, where the ordinary people were not allowed to enter. Instead, the cross-vault B with the expansion around the four directions of its protective hall, allowed the religious people, coming in groups to perform their religious rituals in the holiday etc, surrounding the fire temple, to worship the fire which was temporarily sit on throne.

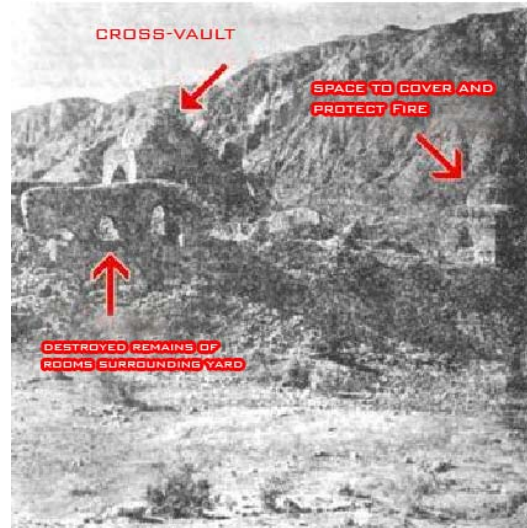


Fig.17 Landscape of fire-temple “Konar Siyah”: “cross-vault” + “space to cover and protect fire” + “destroyed remains of rooms surrounding yard”

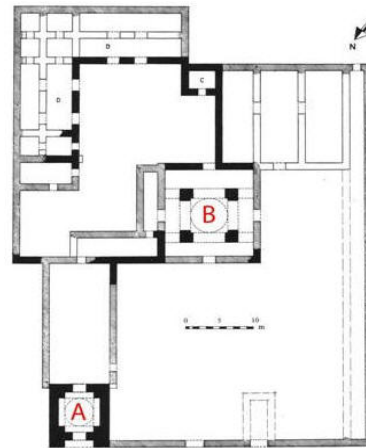


Fig.18 Plan of foundation of “Konar Siyah” fire-temple (Firuz abad in Fars)

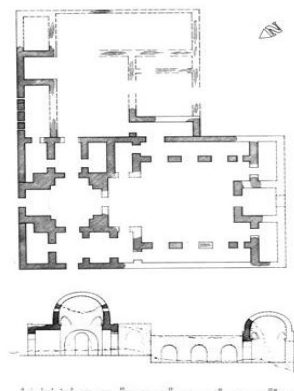


Fig.19 Plan and cross-section of “Roni” or “Rahni” building complex in Southeast of “Farashband”

Also there was “a cross-vault with a conjoined porch and the central yard and the rooms around it” like the collection overlooking the ancient graveyard of the villages “Runi” or “Rahni” in southeast “Farashband” located in the district of “Firuz Abad” in Fars [14].



Šāhār tāq Rohāni near Farrašband

Fig.20 View of inner part of “Roni” cross-vault

*C. Studying Conformity Of Cross-Vault’s Proportion With Inclined Angle Of Sun*

Proportions or “survey traverse” mentioned in the construction of cross-vaults is almost the same. It is said “almost”, because in a list that is provided, by Louise “Vandenburg”, about the proportions of Iran’s cross-vault, some different cases are also seen [15].

The visual line of sunrise from the pillars of cross-vault “Niasar” in “Kashan” at the beginning of the summer (summer solstice) with its visual line at the beginning of the spring and fall (equinoxes) is nearly an angle of 23.5 degrees, however, the visual line of sun at the beginning of the winter (winter solstice) with the equinoxes line is nearly 38 degrees, the cause of which is supposed to be a natural obstacle in the horizon of southeast. That means an obstacle can spoil and make all the calculations different. The observer can’t observe it at the beginning moment of the sunrise and therefore he has to do it sometime following the sunrise.

This raises a question: now that the studies concerning exploration of most solitary cross-vaults in Iran certify the existence of a wall and a circumferential narrow hall of dome-house, the proportions mentioned between “widths of bases” to “length of each side”, and also focus on an angle with a degree of 23.5 (angle of sun’s inclination), then what benefit would this theory have on observing the sun in such a form?

Some examples are mentioned here:

In the cross-vault “Nevis-Tafrish” (border of Nevis village/Northeast of Tafrish), the visual line angles to observe the sun at the beginning of winter, between the bases and equinox time is 33 rather than 23.5 degrees (that means was observing at the beginning of the season missed again like the winter solstice in “Niasar?!” and does it mean that visual line of summer solstice is observable not between the bases rather from the completely widened door of cross-vault, and it can’t be called observing anymore).

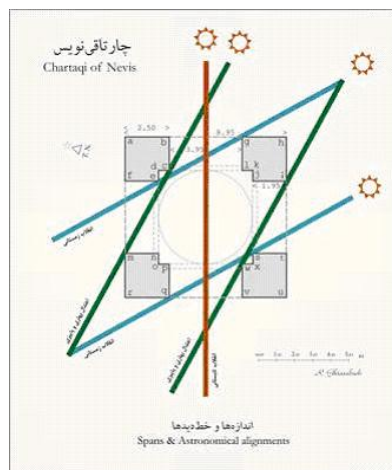


Fig.21 Visual lines offering the theories about Nevis-Tafrish cross-vault

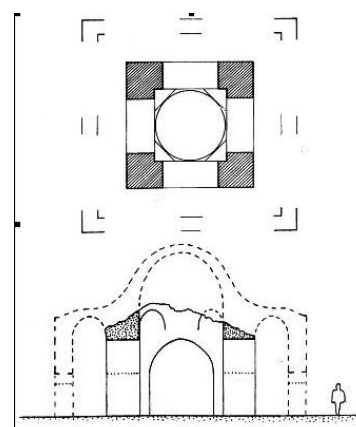


Fig.22 Exploration around Nevis-Tafrish cross-vault and the evidence to circumferential wall which made a narrow hall around square shape dome-house

However explorations carried out around this cross-vault certify a circumferential wall surrounding its dome-house.

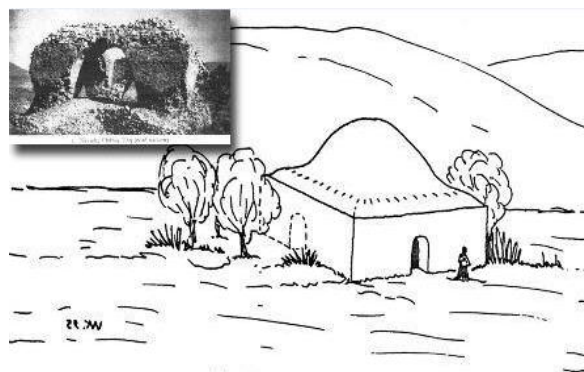


Fig.23 A mended design of cross-vault “Nevis” which gives it a covered shape and a picture of cross-vault at the time of doing research (1965) that a part of wall’s masonry has fall and can be seen around it.

Explorations carried out by “Louise Vandenburg” and “Ditrich Huf” make us familiar with a style of building in many cross-vaults, like the cross-vault “Nevis”: the solitary

cross-vaults once had a curcumferential wall and a narrow hall around the square of their own dome-house that provided closed and covered shape for the cross-vaults. The fact that why most of these walls have been separated from the cross-vault monuments and destroyed, is still a question the answer to which must be looked for not only in the constructs' science, but also in the process of using cross-vaults in Islamic period. Similarly, during his visit from a cross-vault monument in "Kheir" located in Estahban of Fars, Mr. Garrusi mentions the destruction of a high wall surrounding the cross-vaults by shepherds who used the remaining materials again. Likewise, following speaking to the native people and shepherds, he gains some wonderful information about cross-vault monuments. According to their ancestors, it was called "Grave of Ardeshir's mother" which was respected by residents, and some time earlier, anybody crossing by that place, used to go around on bare foot, and depending on their need or vow they had, they used to sacrifice something [16].

Mohammad Taghi Mostafavi in an article on the stone fire holder belonging to Soluki dynasty, located in Daniel the prophet tomb is "Shush", tells about the respect and the need the people used to have to this fire holder. And, also, there was a small octagon tower among Husseyniyeh and "Yazd Tekyeh" called "Kelk" to which people put and hung candles and fire [17].

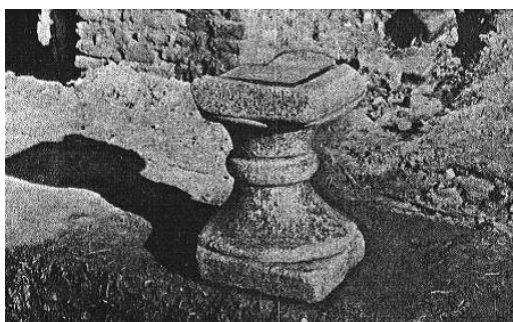


Fig.24 Base of stone fire-holder of Daniel the prophet's tomb in Shush that according to Mostafavi it is from Soluki time

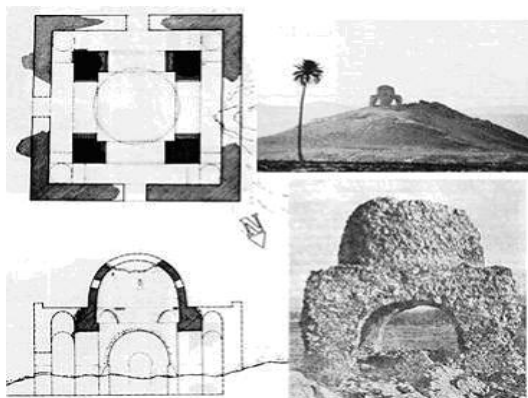


Fig.25 Plan and exploration of walls, renewed cross-section and views of "Shohrshir" (Zahrshir) cross-vault in the middle of route Fasa-Jahrom

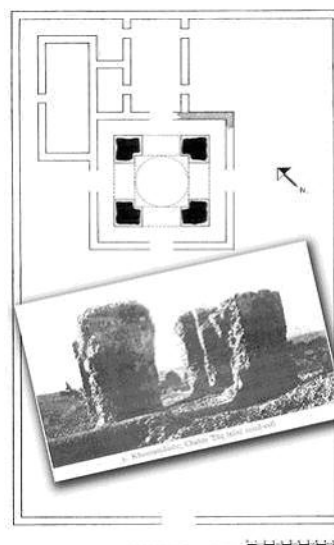


Fig.26 Plan and exploration of "Khorramdasht" cross-vault (border of "Khorramdasht" village/south of Kashan)

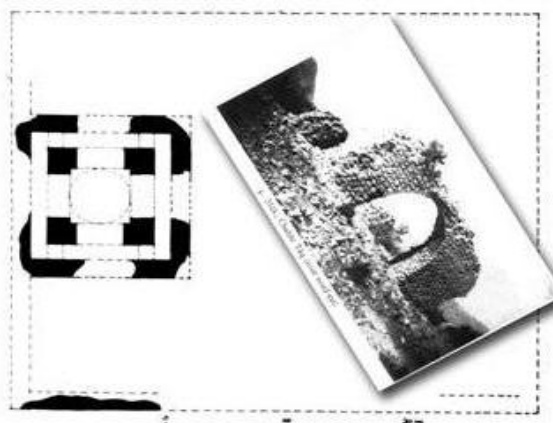


Fig.27 Plan and exploration and view of "Muk" cross-vault with fallen masonry of outer wall/ picture 1965 (border of Muk village/North of Firuzabad)

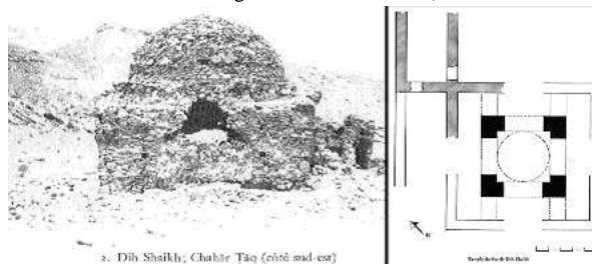


Fig.28 "Dah Sheikh" cross-vault (border of "Dah Sheikh" village/ southwest of "Baft"/Sirjan city) – a picture of remains of curcumferential wall close to it and its exploration plan

And there is a very intact example called cross-vault "Negar" located at 19 km from Negar, a village at 56 km from Southwest Kerman and along an ancient route that started in Kerman and crossed through Negar-baft-Dashte Abdolat Abad to Persian Gulf. The cross-vault monument lies on top of a small hill overlooking a desert. The proportion of the width of



bases to the length of each side which is focused on the calendar theory of cross-vaults is of no use here and all other various examples as well mentioned briefly. The visual line of the sun has connection only with the entrances devised on the circumferential wall, creating a narrow hallway around the central dome-house.



Fig.29 Other views of inner and outer spaces of “Negar” cross-vault



Fig.30 Plan and pictures of “Negar” cross-vault (borders of “Negar” village/southwest of Kerman)

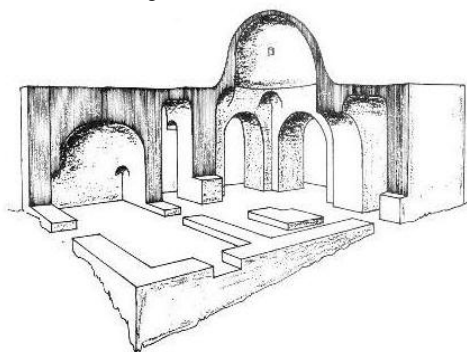


Fig.31 Cut design of “Negar” cross-vault

The whole form of the plan in this cross-vault is similar to the plan reported by “Andrea Gudar” following the exploration of cross-vault “Atashkuh”, “Delijan” in 1938. Here again, like “Atashkuh” – which is a wondering name showing the beauty of the mountain to which fire is lit – a simple architecture space is connected to this monument from entrance direction.

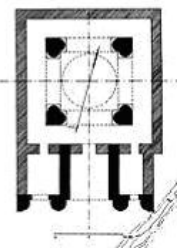


Fig.32 Exploration plan and some façades of the cross-vault “Atashkuh” (located on “Delijan-mahallat” route)

There is of course, another example which is being discussed at the end. And that is the cross-vault “Bazeh-hour” close to “Robate-Sefid” located between Heidarriyehand Mashhad. This cross-vault in the pictures provided by “Andrea Gudar” in 1938, has a closed and covered shape like the examples noted earlier (it is very appropriate for using a fire-holder or a room preserving fire). “Pirnia” in the etymology of the place of cross-vault “Baze-hur” (Arabs have written and called it “Baz-ol-Hamra” in which “Hamra” means “intensity of being hot”) states that “Baze” means a valley or an even ground between two mountains, and “Hur” is the sun, and the reason for this naming is because of its location between two mountains and highlands.

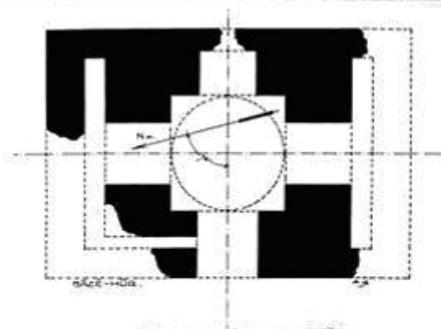


FIG. 29. PLAN DE L'ÉDIFICE DE BAZE-HÜR

Fig.33 An old image of cross-vault “baze-hur”, which shows its location in relation to other adjacent mountains.



Fig.34 A plan and image taken of cross-vault "Baze-hur" in 1938 (near "Robat-Sefid"/between "Torbat Heydarriyeh and "Mashahd"). The remains of the circumferential wall which was closely around the dome-house, are destroyed and evident.

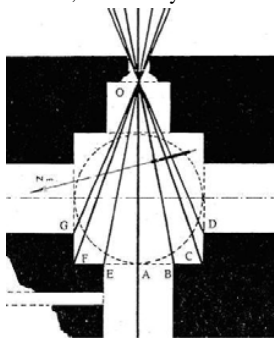


Fig.35 An image providing the calendar function of cross-vault "baze-hur" (manipulated by yhr plan drawn by "Gudar"), using the sun's index shade or the rays cast through a hole on the eastern wall, the monument has been depicted on the western bases of the corners of cross-vault.



Fig.36 cross-vault "Baze-hur" after mending

Now, let's see that what has the calendar theory of this cross-vault been based on?

"It is said that, a tall wall having a certain distance was built in the east side of the monuments and used to be the index (through the calculation that the sun gets 17 degrees farther from the east while it is moving) which caused them to know the right time of observation whenever the sun's rays at dawn would cast upon the solarimeter over the tall wall immediately passing through the cast hole of the monument. The solarimeter of the monument is also considered the internal

part of western basis of cross-vault. In equinoxes, the sun exactly located along the eastern hole and the middle-line of the monument after it has passed over the wall, and a narrow, long index shade which was hung inside the central part of the hole like a pendulum, was placed in the middle of cross-vault, or instead of a pendulum, a funnel-like narrow hole was used on the wall."

It's surprising that the first man to provide the calendar function of cross-vaults simply puts away one of the foundations of the theory in proportion between "the width of basis" to "the length of each side" of cross-vaults as well as observation of the sun through the visual lines created between the basis and has forgotten his own interpretation elsewhere and leaves another explanation on it instead, and through the plan manipulation which "Andrea Gudar" has given about the monument, tries to implicate to the reader that the closely circumferential wall of this cross-vault, implied solar index in one direction (eastern). The introducer of the theory tries to explain a hole on the eastern wall which has been blocked by the menders of the monument with their inconsiderate manipulation.

By referring to the picture treasure in cultural heritage organization in Mashahd of the monument before mending, it was proven to us that whatever was said about the eastern wall of the monument as a solar index and that false hole, was in fact a deceitfulness. Another case which can be mentioned in describing (criticizing) this theory is as follows:

We now know that the task of chronometer was done by those whose jobs were keeping numbers of the days, exact date of ceremonies and calculating the moment at which a year began and knowing leap year, and not by the simple-minded farmers on the borders of a single village. Now, if we are to admit the calendar function of these cross-vaults, what reason was there to make this cross-vault beside a small village?

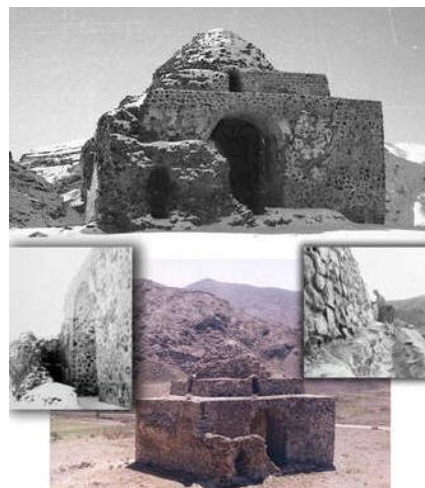


Fig.37 Some images of past (exploration and mending) and recent images of cross-vault "baze-hur"



Fig.38 An image of eastern wall of cross-vault "Baze-hur" before mending and the hole created on it

In another attempt to answer this question, we should say, as it was said, the knowledge of astronomy and astronomers was not possessed by the majority of people in Iran and the governmental and religious centers occupied the positions of observing the conditions of the stars and constellations. Such indications are many times repeated in "Shahnameh Ferdosi".

In the religious letter "Dinkard", besides saying the names of constellations or stars, it is also said that; "By the command of the king, the assistants of astronomy have been chosen to know four seasons of the year and informing them to people".

Of course, ordinary people had not been indifferent to the monuments with astrological characteristics and they used to find out about them curiously. A very famous example is a monument known as the porch "takhte-e-tagdis" whose final construction was performed by "Khosroparviz". It was a throne in the shape of a vault and that is why it was called "Taghdis" (arch-like). This throne had a moveable dome like a sunshade having the shape of the seven planets and constellations and different forms of the moon, and it used to be in "Gazanak" fire-temple.

Mafzal ebn-e-Saad-e-mafroughi in his book "Mahasene Esfehan" (fifth century in lunar calendar) tells of the construction of the castle "Gi" (the city strict of Esfehan in Sassanid dynasty) by "Azar Shapouran" and also a monument of a village outside the castle and city gate in which "Azar Shapouran" built a fire-temple and endowed a village to it [18]. The question, here, is that if the all of these cross-vaults in different parts of Iran lying on the borders of villages and routes had a calendar function and winter or summer solstice was visible in them and knowing that the astronomers or people of that era needed to know the exact time of the beginning of seasons, then why don't any of these ancient historians and geographers mention and focus on this functional calendar? "Abo alghasem ibn-e-Ahmad Jaihani" in his book "Ashkal Alalam" (forth century lunar calendar) says that: "the fire holders are innumerable and too many to memorize, because one cannot find any city or village where there are not any fire holders".

Another question concerning the above-mentioned theory was that what need was there to build pillars with this

thickness and width, dome-like roof, yard-building and also floor construction in the cross-vault Niasar to observe the raise of the sun through the basis of the pillars? If the task of determining seasons was carried out by this method, then did they stop working to determine the seasons during some times of the year in which it was cloudy or windy and snowy in these mountainous areas especially in the fall and winter?

To answer to this question, according to the systematic table of "Survey traverse" in cross-vaults that had been provided by "Vanderburg" in 1965, the following were carried out: Arranging the architectural elements in an Iranian design is performed by analyzing the sizes and some certain criteria, in which the architect creates the spaces required in their proportions and prepares the given design by decreasing or increasing and replacing its elements. "survey traverse" has not only effects on the plan and sizes of basis and the pillars and also the width and length of the spaces, but it also determines the form and the shape of the façade and the proportions of the doorways, more over it has a great effect on covering the porches, vault and dome-houses. It means that the height and shape and also the curve of the "dome" is determined with regard to survey traverse, therefore, the architect can perform the design and calculation and executing it at the same time provided that a carrying out survey traverse has enough guarantee, without any worry about the instability and disproportionateness of it.

Architectural survey traverse in Iran has been used since very ancient eras up to now and has been inherited from fathers to sons. Again this question is raised that: if the architect of the cross-vault Niasar made this document in order to observe the sun through its bases, then again why did he construct the dome on a square background of the monument (11×11 m<sup>2</sup>), and build very thick bases (3.3m) to undergo its heavy load concerning survey traverse, and consequently waste the materials and money of his employer? In fact, the proportions which is focused between "widths of bases" to "length of each side" in the cross-vault Niasar (proportion to 3.3) is the proportion which has been imposed on the architect due to construction of dome on the bases, and not the way which the provider of calendar theory function thinks of: making it possible to observe the sun through the bases! The seat and the rubble stone foundation placed in mortar of another monument is evident in the picture in some distance away from the cross-vault.



Fig.39 An old picture of the cross-vault Niasar which "Gudar" mentions in the book "Iran's works" in 1938

## V. CONCLUSION

It is concluded through studying and analyzing all of the cases in calendar function theory of Iran's cross-vaults that these monuments were but worshiping places and all of these were false theories which have been provided during a few years by some researchers in which in "Shahnameh" and "Dinkard", etc. the name of astronomers and Zoroastrian priests were seen with each other several times and they attempted to find some signs of astronomical characteristics in these religious places.

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