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Mashar Historical Observatory Discoverer in Ha'il – KSA in 1443H / 2022

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المستخلص:

مرصد مشار الفلكي المكتشف في مدينة حائل في السعودية عام 1443 هـ / 2022 م

تعد المراصد الفلكية من أهم شواهد إبداع الحضارات القديمة، حيث ربطت من خلالها عباداتهم وطقوسهم وأنشطتهم الحياتية بمعرفتهم بمتابعة الأجرام السماوية، بيد ان العثور على بقايا وادوات لمرصد فلكي ليس سهلا ، وذلك لعدم امكانية الحفاظ مع مرور الزمن للأدوات التي كانت مستخدمة في الرصد والتي عادة ما تعتمد على الرؤيا بالعين او استخدام ادوات مصنوعة من الخشب، تعمل الطبيعة على إتلافها بمرور الزمن.

وفي بحثنا هذا يبدو ان الحظ حالفنا في العثور على اول مرصد فلكي طبيعي من صنع الطبيعة والإنسان في ارض الجزيرة العربية، حيث تنتشر العديد من المواقع الأثرية التي يعود تاريخها إلى العصور القديمة في جميع أنحاء المملكة العربية السعودية. ونعرض في هذا البحث ما توصلنا إليه من ملاحظات متتالية اخذت جهدا ومتابعة تربوا على 10 سنوات، أدت إلى اكتشاف مرصد محتمل في جبل "أجا" بمنطقة حائل في المملكة العربية السعودية، واطلق عليه "مرصد مشار الفلكي".

الكلمات المفتاحية: الفلك، مرصد، الجزيرة العربية، المملكة العربية السعودية، جبال أجا، مدينة حائل.

Abstract:

Astronomical observatories are one of the most significant pieces of evidence of creativity of ancient civilizations, through which they linked their worship, rituals, and their life activities with their knowledge of following-up the celestial bodies.

Many archaeological sites dating back to ancient times are scattered throughout the Kingdom of Saudi Arabia. In this report, we present our finding of 10-year consecutive observations that led to the discovery of a potential observatory in the Agaa Mountains in city of Ha'il region. It is known locally and internationally as the Mashar Astronomical Observatory.

Keywords: astronomy, observatory, the Arabian Peninsula, the Kingdom of Saudi Arabia, the Aja Mountains, city of Ha'il.

1. Introduction

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Ancient cultures attempted to track the movements of celestial bodies in order to connect their worlds to those above (and below) through the magnificent and mysterious structures they built. For the people who built these structures, the complex and periodic nature of the motions of the sun, moon, planets and stars represented perfection beyond the reach of mortals [Deborah Scherrer, 2018]. By carefully marking their appearances and disappearances, they combined religious worship with practical knowledge. The cycles of grain and harvest are regulated by celestial events; important festivals and festivals are marked on the almanac. Over a few generations, they learned to predict certain celestial phenomena well in advance, such as solar eclipses [Deborah Scherrer, 2018. Stoev A, 1993. pp. 85-92].

For example, the Mnajdra temple complex [Renfrew, C., 1977, pp.614–623.] on the southern coast of the island of Malta in the Mediterranean is designed so that sunlight enters from the main entrance and illuminates the main axis of the equinox, while in the solstice sun illuminates the edge of the boulder on the left and the right of entrance. The Temple of Abu Simbel in Egypt [Goldschmidt, Jr., Arthur; Lawrence Davidson, 2005] is another example of such ancient structures. The axis of the Great Temple was positioned by the ancient Egyptian builders, so on certain dates (October 22 and February 22), the calculations were based on Sirius (Sothis) in the Heliac period. Ana Sofar the famous sun dagger in Chaco Canyon is another example of ancient structure [Deborah Scherrer, 2018]. This petroglyph was carefully crafted to mark the cycles of the sun and possibly the moon as well.

Other such structures are distributed worldwide to prove the sophisticated architects and astronomical knowledge of the ancient civilizations [Deborah Scherrer, 2018].

Many archaeological sites, dating back to ancient times, are scattered everywhere in the Kingdom of Saudi Arabia. These sites indicate that the region was once inhabited by humans who built ancient civilizations that flourished on the land of the Arabian Peninsula [Goldschmidt, Jr., Arthur; Lawrence Davidson, 2005, p.48].

Hail region is located in the northern part of the Arabian Peninsula [Goldschmidt, Jr., Arthur; Lawrence Davidson, 2005, p.48], which was inhabited by many ancient civilizations. It is also surrounded by many ancient civilizations such as the Babylonian in Iraq and the Egyptian. Hail is, also, characterized by its proximity to several lands of prophets, such as the people of Thamud, Madyan and others [Goldschmidt, Jr., Arthur; Lawrence Davidson,

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2005, p.48]. This means that Hail witnessed the presence of ancient civilizations which, without any doubt, has a part of the evidence of these civilizations.

2. **The Aga Solar Observatory:**

The discovered observatory is located about 10 km to the west of the city of Hail, specifically, east of Wadi Machar [Goldschmidt, Jr., Arthur; Lawrence Davidson, 2005, p.48]. The observatory consists of three main parts, the main hole, the indicators, and the ground projection or reference point (Figure 1).

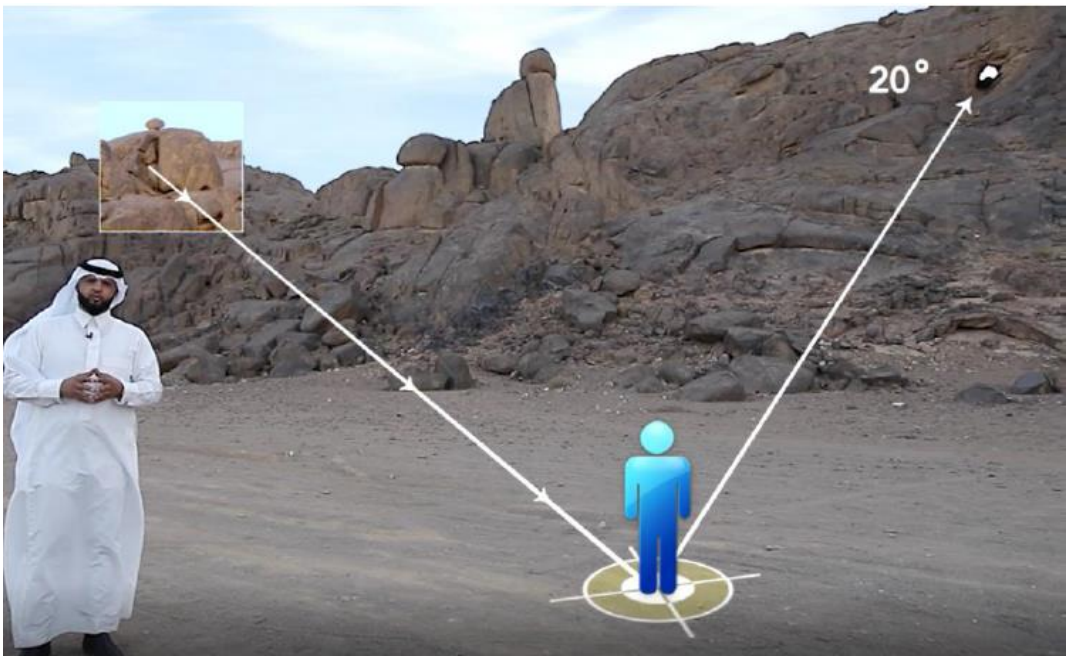

Figure (1) indicates the main three components of Ajaa Observatory.

The **main hole** has a horizontal inclination with seven meters depth, three meters wide and about four meters height (Figure 2.a).

The position of the hole is characterized by its location between the East and the West, which is the way for the stars and planets to cross and the horizon is revealed behind it.

The **indicators** are indicative signs showing the mechanism of the observatory's work and to determine the reference point for observations. They are 180 meters from the southern side of the main hole (Figure 2.b). A closed hole similar to the observatory hole is one of the descriptive signs for the observatory aperture. Two rocks, triangular and circular, have a distinctive feature, as they serve as a tool for guidance, control and accuracy (Figure 2.c). There is no doubt that they have a close relationship in determining the

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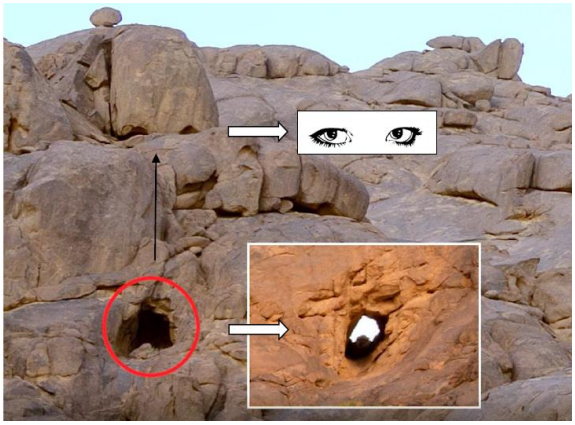
reference point of the observatory.

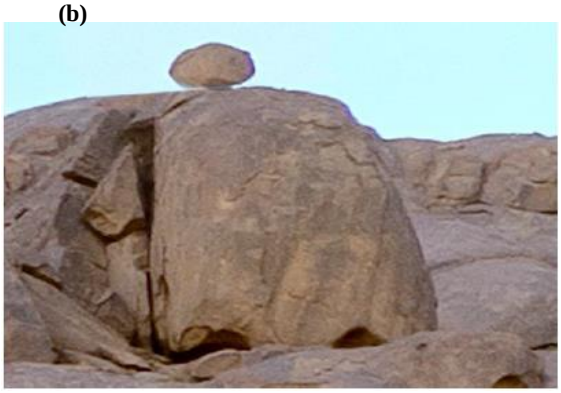
The main focus of our exploration was to locate the exact ground point for all measurements taken relative to the main hole. Finding this point was challenging because understanding the connection between the main hole and indicators is difficult. Several trials have been conducted by moving in a different direction from one specific point around the hole. This led to additional discoveries about how moving in different directions influenced indicator spacing. (Figure 2.c and d). We have found that when we reached to a point on the ground and aligned precisely with the two rocks, we were able to determine the reference point. It is worth noting that after applying the previous marker (triangular rock head standing at the given reference point), due to the proximity of the reference point, the stone appears to us as an auxiliary marker for standing exactly at the reference point (Fig. 2.e). This reference point is the most important part of the observatory and gives the exact location of the observations. The discovery of the observatory's reference point is considered one of the most important results we have achieved after interpreting the signs, as we want to know the truth about this observatory and how it works. The reference point is determined based on the exact alignment of the used indicators; our next task is to make practical observations to understand exactly what the observatory is for.

(a)

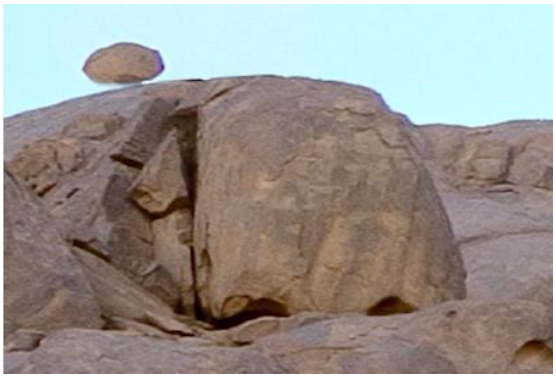
(b)



(c)



(d)



(e)

(f)

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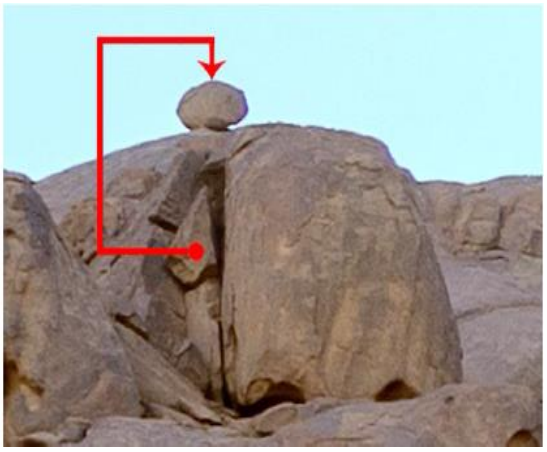

Figure (2) presents the three components of the observatory (a) the main hole; (b) shows the distance between the main hole and the indicators; (c) shows how the indicators (triangular and circular rocks) look apart as we move to the right from the reference point; (d) same as (c) but we move to the left from the reference point; and (e) shows that the triangular and circular rocks (indicators) are aligned when they are seen exactly from the reference point.

3. Astronomical observations:

The first discovery we made from our observations was to determine how much the observatory's hole is tilted at the reference point; any star or planet passing through the main hole seen from this point is at (20̊) astronomical degrees. This is done using Redshift software. The first object we observed through the hole from the reference point at night was the star in the constellation Taurus (Aldebaran) in 2016 (Fig. 3.a). The second object we focus on is the sun. At different times of the year, sunrise and sunset was observed at different points and during different time periods relative to our horizon. Based on our six years of careful observation, we found that the solar disk passes directly and exactly through the hole, projecting onto the reference point twice a year. The first date is August (5) (Leo) and the second is May 5 (Fig. 3.b-d).

(a) **(b)**

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(C)

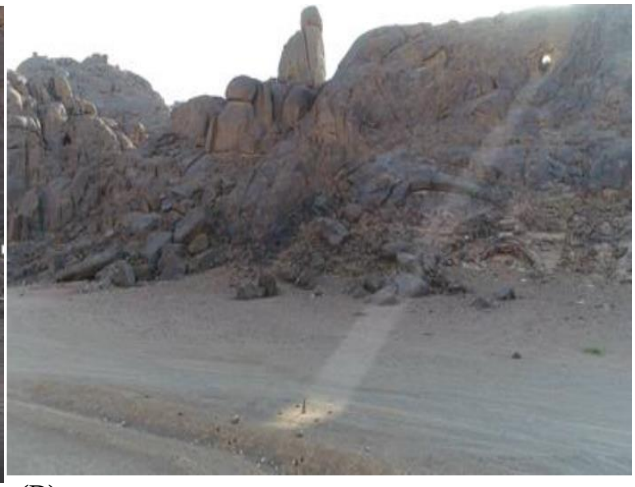
(D)

Figure (3) presents the observations of Aldebaran and the sun at Agaa observatory at the reference point (a) Aldebaran star; (b) the passage of the solar disk through the main hole on the 5th August and 5th May; (c) and (d) the projection of the sun light on the reference point on the 5th August and 5th May.

4. Ancient Civilizations:

Surviving events suggest that these dates are somehow related to major events for the ancient people who inhabited the area. So our next step is to understand the results obtained and try to interpret them from the point of view of the civilizations that inhabited the region. This is not an easy task, so the literature (very scarce indeed) had to be searched to find out what culture lived in the area and designed such a structure. The study area is surrounded by two famous civilizations, the Mesopotamia and Egyptian civilizations [جوزيف ممدوح صالح بدير، 2005، ص61. توفيق،2017، ص ص 22-25] and the Babylonian civilization [عبد الرحمن، عبد الملك،1985، ص70]. Other civilizations can also be expected to live in the area. After extensive investigations in several literatures, we have found that both the Egyptian and Babylonians civilizations agree that the Leo is a special month for the sun, and we found this clearly in their blogs [جوزيف ممدوح توفيق، 2017، ص ص 22-25. عبد الرحمن، عبد الملك، 1985، ص70]. They believed that there is a relationship between the lion and the rising and setting of the sun, and lions are the protectors of the horizon and have a connection with the sun God. In Babylonians, they call (the Leo) the month of the sun (August), which is the fifth month and the lion was a symbol of the sun God. They symbolized the sun with the number (20) [شيماء النعيمي، 2006، ص68].

Thus, the relationship between the sun and the sign of the Leo in ancient civilizations is compatible with the numbers that we have recorded in the Agaa

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observatory. The sun is observed in 5th August, in the sign of the Leo, i.e. in the month of the sun. The interesting thing, which was confirmed by our observations, is that at 5.20 pm on the 5th August the sun exactly passed through the hole and projected exactly at the reference point. We do believe that the choice of this number was not a coincidence, but it results from a clear and accurate understanding of astronomy according to the ancient concept. The 5th hour of the day represents the most important hour in the sun's journey to the other world inhabited by (Osiris) in the gate 5, which is a symbol of life and rebirth [شيماء النعيمي،2006، ص68. عبدالحليم نور الدين،2016، ص 438]. We do not rule out that this ancient belief has its origins in this region, so this date is the birth of the first day of the New Year. The famous astronomer Saleh Al-Ajiri [صالح العجيري] - may God have mercy on him - mentioned to me, in a private communication, that 5th of August is the beginning of the year for the ancient Egyptians, and it coincides with the emergence of the Sirius star .

The other interesting finding from our observations is that the degree of inclination of the hole at the reference point is 20 degrees. When the sun is observed at this altitude we find it identical to the numerical symbol of the sun at the Babylonians [شيماء النعيمي،2006، ص68], which is the number (20), and we find that the number (20), so the numerical symbol of the sun coincides with the result of the earthly signs of the reference point (20), as well as in the minute of entry. This definitely confirms that the signs placed next to the observatory are correct and have a relationship with the observatory. The date, the month, the altitude of the observatory, and constellations, confirms to us, once again, that these numbers and actions are the result of an accurate arithmetic work, so it is unreasonable for this coincidence to be by chance.

Regarding to the he 5th of May passes of the Sun we could not, yet, reached to a certain conclusions due to the lack of the available literatures. However, we have found that May is the second month in the Babylonian calendar [عبد الرحمن، عبد الملك،1985، ص70]; it is called (the month of holy light) because of its association with the moon. It is also associated with agriculture. As for the Egyptian civilization, (Shahrbashans) begins on either day: 9 or 10/5 (May), corresponding to the sign of Taurus [شيماء النعيمي،2006 ص68]. It was known to them as the month of the moon god. The consolation in the past is related to the moon and agriculture, as it is one of the agricultural calendars.

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Conclusions:

Considered one of the most important areas of the Arabian Peninsula, the Hail region has seen many previous civilizations settle there, leaving behind many undiscovered evidence of progress and civilizations living in the region. In this study, we present some preliminary results from astronomical observations and a 10-year continuous tracking of archaeological sites in the Wadi Machar region of the Agar Mountains. The site is a potential observatory for observing celestial objects at specific times and occasions. The site consists of three basic components, the main hole, the indicators, and the reference point. They are both symbols of a target and separate tools.

This main hole is in the center of the Agaa Mountain that has specific dimension through which celestial objects can be observed when standing on the ground at a reference point and at a specific time. It was difficult to identify this reference point, because using the indicative notation requires several years of experimentation and observation to reach the reference point. We have made multiple observations to reach the exact location of this reference point, which we can observe the celestial objects through the main hole. After confirming the observatory's reference point for the first time, we continue to monitor the celestial objects that can be monitored. The most important and exciting observation we've found is that the sun's disk passes through the observatory's main hole, and its light falls on the reference point at exactly 5:20 pm on 5^{th} of August the sun's entry date, while on 5^{th} May its entry is at the specified point at 5:09 pm.

We have tried to find explanations in historical books and available references to link our findings from these observations to believe of the civilization that occupied and built this structure. From some of the history books, available and some of our interviews with experts in the history of astronomy, we realized that August 5th was the first day of the year of the Egyptian civilization. We also realize that the Babylonians used the number 20 to symbolize the sun, which tells us the height of the observatory opening, and that August was the month of the Lion. There is no doubt that these observations and signs are not accidental, but astronomical knowledge based on astronomical calculations of the civilizations inhabiting the region. We believe that through further observations and continued tracking of the celestial objects passing through the observatory, as well as by consulting historical books, we will further discover the mysteries of the observatory and the civilizations that inhabited the region.

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