

King Hezekiah and the Miracle of the Moving Shadow Sign

By Dr. Frederick W. Baltz

adapted from a chapter in *When the Bible Meets the Sky*

“He trusted in the LORD, the God of Israel, so that there was none like him among all the kings of Judah after him, nor among those who were before him.”

2 Kings 18:5

The Assyrian Threat

One of the most remarkable kings to occupy the throne of ancient Judah was Hazaqyah, Hezekiah. His name means: the Lord strengthens. Hezekiah was the son of Ahaz, a man who put his own interests and concerns ahead of faithfulness to God, and did great harm in the process. The sign of the moving shadow that we will explore in this article deserves a thorough introduction in order for us to understand the depth of the dire situation facing Hezekiah when his father died at age thirty-six. The sign spoke to that situation.

Hezekiah’s father Ahaz lived in fear of Israel and Syria to the north. The kings of these two nations, Pekah and Rezin, threatened to force Ahaz into an alliance with them, because they feared the rising power of Assyria to the east, led at that time by Tiglath-Pileser III.

All nations had reason to fear Assyria. The Assyrians were infamous for the intentional, sadistic cruelty they inflicted without exception upon the people they defeated. This viciousness was an essential part of their warfare, a type of terrorism that went before them. The stories told by witnesses made clear that if the armies of Assyria came into sight on the horizon, no worse future could be imagined.

The Assyrians were quite capable of engaging armies in the field, and even at sea, but much of their warfare was waged against walled cities. A high-ranking officer of the Assyrian army would approach the wall of the city and issue an ultimatum to the leaders within. There would be only one chance to surrender and live; that chance was now. Behind this threat was the fact that no city-state or nation had been able to stop the Assyrians in their quest for ever-greater power and territory.

At least one of three things would happen. (1) The people of the city would suffer hunger or starvation. (2) The Assyrians would breach the walls, undermine them by digging, or cross

them with scaling ladders, and overtake the city. (3) An unforeseen deliverance would keep the Assyrians from their victory.

If the city leaders surrendered, they kept their lives, and people in the city were resettled in a different land, never to see their homes again. That was the least violent way the Assyrians ever conducted themselves, destroying hope and preventing the possibility of rebellion.

If the city's leaders did not surrender, hoping their gods would deliver them and trusting that they had enough grain and water inside, they were risking their own lives, as well as the lives of many more. Then, if Assyria's overwhelming numbers won their victory, there would be torture and mass killing. It would inevitably follow the siege.

The purpose of the city's defensive wall was to provide protection against enemies. But for how long? Inside were food stores kept against the threat of a siege. Water was indispensable as well. Unless water was available from a source within the city, it was kept in vessels that were bound in time to run out, just as the food was. Siege warfare was largely a matter of time...of waiting. Who could afford to wait longer, the aggressors or the defenders? For those inside a besieged city, the psychological pressure of the siege was horrendous.

From the city wall archers could shoot arrows down at the invaders, but there was little more they could do. The city gate had to remain barred against the enemy, and even if a company of defenders might have gone outside the city to fight, they would be no match for the superior numbers of Assyrians.

Soon siege towers, which the Assyrians had perfected and brought here on wheels, were fully assembled and rolled up against the city wall. These were actually multi-story armored buildings with battering rams inside. Soldiers within the towers were protected from arrows. Together they would swing the suspended rams until they pulverized the wall surface ahead of them.

When the moment came that the Assyrians gained entrance to the city, the torture and killing began which would make this city one more example of what happened to anyone who did not immediately surrender. Everyone had heard what the Assyrians did to their victims. The city leaders who had reached the decision not to surrender might be placed in iron cages suspended where all could see them, left there to die of exposure, starvation and thirst in full view. Others within the city were literally skinned alive. Still others were impaled on poles. Children and youth were exterminated in fires. Still others had eyelids cut off, or eyes gouged out, or noses and other body parts cut off. Some were beheaded.

Assyrian soldiers served one year with two years off. They tended all to be experienced in battle because of this. The extreme cruelty which they routinely practiced seems to have been so terrible that it even effected them. What we call Post Traumatic Stress Disorder may be at the root of stories from Assyrian soldiers who believed they were haunted by people they had tortured! ("The Assyrians — The Appalling Lords of Torture: Impalement, flaying, and

amputations were the trademark of the Assyrians.” Peter Preskar, Dec 27, 2020. Lessons from History <https://medium.com/lessons-from-history/assyrians-torture-60fabb7a9642>)

Immanuel Sign

So Judah’s King Ahaz, Hezekiah’s father, found himself in the position of having to choose whom his enemies would be, Rezin and Pekah, or Tiglath-Pileser III of Assyria. Pekah and Rezin threatened Ahaz with destruction at their hands if Ahaz did not join their anti-Assyrian alliance. Assyria loomed as a threat on its way. It was at this time that God’s prophet Isaiah was sent to Ahaz with a prophetic oracle and a sign. This king, who had actually closed the Temple doors, claimed his faith was sufficient so that he didn’t need a sign. Isaiah told the pretentious king the Lord would send a sign anyway! “Behold, a virgin will conceive and bear a son, and will call his name Immanuel (Isaiah 7:14.)” It’s called today the Emmanuel Sign. Christians also connect it to the birth of Jesus many years later. Before Isaiah was finished, he told Ahaz that soon Rezin and Pekah would no longer be a threat; they would be gone, because the Lord was bringing the Assyrians on the scene.

It wasn’t long before Isaiah’s words proved true. The kingdoms of Israel and Syria were no more. Assyria had vanquished them. Ahaz even supplied troops for Assyria, and paid tribute to be a vassal state in lieu of being conquered like the rest. He remained a sell-out, transforming the worship of Yahweh as it had come down from Moses through Solomon.

17 And King Ahaz cut off the frames of the stands and removed the basin from them, and he took down the sea from off the bronze oxen that were under it and put it on a stone pedestal. 18 And he covered the way for the Sabbath that had been built inside the house and the outer entrance for the king he caused to go around the house of the LORD, because of the king of Assyria. 19 Now the rest of the acts of Ahaz that he did, are they not written in the Book of the Chronicles of the Kings of Judah? 20 And Ahaz slept with his fathers and was buried with his fathers in the city of David, and Hezekiah his son reigned in his place. 2 Kings 16:17-20

Ahaz was not the only sinful king in Judah’s history, but he had become the worst. He even offered a son as a human sacrifice to the idol Moloch (2 Kings 16:3)! This was strictly forbidden in the Law (Leviticus 18:21), but Ahaz was devoted to syncretism, not to Israel’s God alone. We do not know that son’s name, but he might have been king one day if the circumstances had been right. Hezekiah was the son that lived.

In such an atmosphere as this, Ahaz’ son Hezekiah emerges as an astonishing contrast to the religious corruption of his father. When Tiglath-Pileser III’s successor Sargon II died, Hezekiah revolted against Assyria. He stopped paying tribute to the new Assyrian king, Sennacherib. He began to prepare Jerusalem for a siege. His workers cut the famous tunnel through rock beneath the city to bring water inside from a hidden source outside the wall, the Gihon Spring. The Siloam Inscription was found at the meeting point where workers met other

workers tunneling from the other direction. Water would now be always present inside the city. Hezekiah had at least secured that. He set out to maintain stores of grain as well.

Hezekiah was not only a king with strategic interests for his city's defense. More than that he was a religious reformer. He restored the proper ceremonies within the Temple, and destroyed the altars and high places approved by his unfaithful father. Hezekiah would trust the God of Israel, and he would believe the prophets such as Isaiah, rather than ignore them as his father had done.

Hezekiah had surely taken action against Assyria their king would not tolerate. Both Israel and Syria had only recently fallen, though they were united against Assyria. Judah was small by comparison. No other king or nation had stopped the Assyrian advance. The chances of Hezekiah's success in practical, worldly terms were nonexistent. It was only a matter of time now before the Assyrian army would appear on the horizon, coming this time for Jerusalem and Hezekiah.

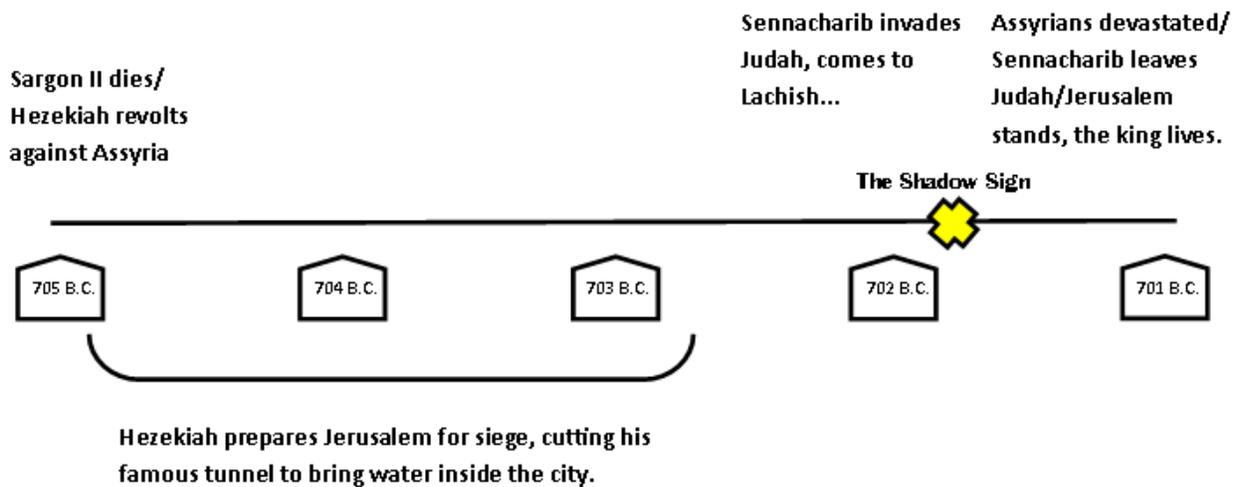


Figure 2. Hezekiah timeline.

That day soon arrived. Thousands of Assyrian soldiers in their characteristic conical helmets of bronze stood at a distance. The Rabshakeh, cupbearer to the king, rode up to the wall of Jerusalem. His ultimatum came in the language of the people in order to terrify them all. These people inside knew that Hezekiah's new tunnel would provide them with water in case of a siege, but the Rabshakeh's threat, that they were doomed to drink their own urine and eat their own dung, must still have been chilling.

No city official gave the Rabshakeh an answer. The King was not present among them. Then the Rabshakeh claimed Judah's own God, Yahweh, had sent the Assyrians. How futile

would resistance be against their own God?! But that attempt to sow fear was not enough for the Rabshakeh; he then proceeded to revile and blaspheme Yahweh.

This was the same Yahweh who three centuries earlier had assured King David that he would maintain this city and its throne in the hands of David's descendants. True, the people had proven unfaithful, as had their kings. They had proven unworthy of that promise. But Isaiah's words, and the sign from heaven we are about to consider now, surely meant that Yahweh was keeping that promise anyway. It is important to understand that Hezekiah was a king from David's line.

The Rabshakeh finally left the city wall with no answer from Hezekiah. The sun set on the tents of the Assyrian camp with its thousands of battle-hardened sadist-soldiers waiting for Sennacherib himself to arrive from the siege of nearby Lachish.

When the sun rose the next morning the Assyrian camp was eerily silent, motionless. During the night the would-be killers had died in their tents. Swiftly, unexpectedly, the Assyrian threat was broken. Sennacherib never arrived at Jerusalem. His plans changed suddenly. He returned to his home where he was later assassinated. In his boasting about his conquests Sennacherib could only claim that he shut up Hezekiah like a bird in a cage.

The historian Herodotus, writing around 450 B.C., described a somewhat similar event happening in Egypt between the Assyrian and Egyptian armies. The Assyrian camp was overrun by mice that ate components of their weapons, such as bow strings, leaving the Assyrians unable to fight. Some consider this report to be an adaption of the actual biblical event in Jerusalem.

Berosus, a transplanted Babylonian in Greece, writing in the Third Century B.C., corroborates our biblical texts in these words preserved by Josephus:

“Now when Sennacherib was returning from his Egyptian war to Jerusalem, he found his army under Rabshakeh his general in danger [by a plague, for] God had sent a pestilential distemper upon his army: and on the very first night of the siege an hundred fourscore and five thousand, with their captains and generals, were destroyed. So the King was in a great dread, and in a terrible agony at this calamity; and being in great fear for his whole army, he fled with the rest of his forces to his own Kingdom, and to his city Nineveh. And when he had abode there a little while, he was treacherously assaulted, and died by the hands of his elder sons Adrammelech and Sarasar: and was slain in his own temple, which was called Araske. Now these sons of his were driven away on account of the murder of their father by the citizens, and went into Armenia. While Assarachoddas took the Kingdom of Sennacherib.” (Quoted by Josephus, Antiquities of the Jews, Book X, Chapter 1, paragraph 4 & 5).

The Sign

All this is the background for the sign we are considering in this chapter. Such were the stakes; they could be no higher! Now let us look carefully at the biblical text, 2 Kings 20:1-11. This is where we find the story of the moving shadow, and also in Isaiah 38:1-22, with mention in 2 Chronicles 32:24.

In those days Hezekiah became sick and was at the point of death. And Isaiah the prophet the son of Amoz came to him and said to him, “Thus says the LORD, ‘Set your house in order, for you shall die; you shall not recover.’”² Then Hezekiah turned his face to the wall and prayed to the LORD, saying,³ “Now, O LORD, please remember how I have walked before you in faithfulness and with a whole heart, and have done what is good in your sight.” And Hezekiah wept bitterly.⁴ And before Isaiah had gone out of the middle court, the word of the LORD came to him:⁵ “Turn back, and say to Hezekiah the leader of my people, Thus says the LORD, the God of David your father: I have heard your prayer; I have seen your tears. Behold, I will heal you. On the third day you shall go up to the house of the LORD,⁶ and I will add fifteen years to your life. I will deliver you and this city out of the hand of the king of Assyria, and I will defend this city for my own sake and for my servant David's sake.”⁷ And Isaiah said, “Bring a cake of figs. And let them take and lay it on the boil, that he may recover.”

⁸ And Hezekiah said to Isaiah, “What shall be the sign that the LORD will heal me, and that I shall go up to the house of the LORD on the third day?”⁹ And Isaiah said, “This shall be the sign to you from the LORD, that the LORD will do the thing that he has promised: shall the shadow go forward ten steps, or go back ten steps?”¹⁰ And Hezekiah answered, “It is an easy thing for the shadow to lengthen ten steps. Rather let the shadow go back ten steps.”¹¹ And Isaiah the prophet called to the LORD, and he brought the shadow back ten steps, by which it had gone down on the steps of Ahaz.

The Order of Events

Reading the text in order, it may seem that the story of God’s miraculous defense of Jerusalem in 2 Kings 19 had already happened before Hezekiah’s illness and the accompanying sign. But we have two reasons to think otherwise.

First, the text begins: “In those days...” This is a general time reference that does not require the story of Hezekiah’s miraculous healing to follow the deliverance of the city.

Second, the Lord says through Isaiah to Hezekiah, "...and I will add fifteen years to your life. I will deliver you and this city out of the hand of the king of Assyrian, and I will defend this city for my own sake and for my servant David's sake (v. 6)." It certainly seems that Hezekiah's illness preceded the attempted siege.

This means that the sign given Hezekiah was first of all a confirmation that he would continue to live, but second, a confirmation that Jerusalem would not fall to Assyria. After all, what difference would it have made for Hezekiah to recover if that only meant death or imprisonment at the hands of the Assyrians? So, while the sign is specifically related to Hezekiah's recovery, it means still more. It means Hezekiah is to be faithful and stand firm against the advance of Sennacherib's armies.

When the Assyrian horde came up to the wall of Jerusalem from the north, Hezekiah had already received the sign from the Lord. That is what we must conclude if we read the text carefully.

Looking More Closely

The sign offered to King Hezekiah involved a movement of the normal shadow in a direction contrary to nature. Numerous attempts have been made to explain this apparent backward motion of the sun's shadow. There are those who say we must not do that, because it amounts to questioning God or the Bible. Others have said an instant reversal of the earth's rotation, with no noticeable effects to anyone or anything on the earth's surface despite that sudden stop, is the explanation of what happened. For those intent on denying all miracles, this story is just another tale.

We might mention here Camille Flammarion, a French thinker whose thoughts led him to diverse areas of interest. One of those areas was astronomy. In 1885 Flammarion published an article about a particular sundial in the Observatory of Juvisy in Paris. By adjusting the angle of the base of the sundial, Flammarion was able to achieve a retrogression of the sun's shadow. This is just one of the attempts by researchers to take seriously the 2 Kings account and move toward an explanation of how it may have happened. The great difficulty with Flammarion's attempt is that it requires the actual manipulation of an unheard-of kind of sundial.

In the early years of the 20th Century the famous astronomer E. W. Maunder took up this matter as well, attempting to show by mathematics that a retreat of the shadow on a sundial was possible.

Does God use only the supernatural in the working of signs, miracles? Is the natural supernatural already, since God made the natural too? Is it wrong to explore the ways God may have brought about this event, or is this rather a kind of praise that comes from believing the Bible first of all, and hoping to discover more?

The *Ma'aloth*

Are we to think of the shadow moving on a sundial or on a stairway? Translators are making a choice between these options when they translate *ma'aloth*. They have no way of being certain what it meant to the writer. Apparently, that writer already knew what the *ma'aloth* of Ahaz were, and it seems his first audience did also, because he sees no need to explain it. But that knowledge is now lost to us. All we can do is attempt to understand by creating possible scenarios and eliminating others.

A sundial of some kind is certainly within the range of acceptable meanings for *ma'aloth*. Sundials and sun clocks predate Hezekiah. They have been found in Egypt from about 1500 B.C., and in Ukraine from about 1300 B.C. Mesopotamian knowledge of how to use the sun's shadow to indicate time is attested for this period as well. In fact, Mesopotamian astronomers divided the sky into 360 degree intervals, and used this 360-division system for reckoning day and night, watches within them, and half-watches.

The principle of the sundial is simple. As the sun moves across the sky from East to West through the daylight hours, the shadow it casts from a fixed post moves in the opposite direction. By indexing the positions of the shadow to the times of the day, ancient people could mark the passing of time. This was for general use, not precise. It served to give a simple, visible measurement of the working hours of the day.

The word sundial brings to mind a horizontal disc with numbers around the perimeter, and an upright angled piece called the gnomon to cast the shadow on the disc. That's how we envision it, but it is only one form the sun clock has taken, and from a time later than our event.

Earlier, in Egypt, one type of sun clock consisted of a short horizontal bar casting its shadow along a longer bar extending from beneath the short bar and perpendicular to it. Another type was a stone with a concave depression cut in it. A gnomon was set in the center of the diameter line. Marks inscribed on the concave surface marked the hours.



Figure 3.

Ancient Egyptian sundial with a socket for the gnomon (absent), and twelve divisions for hours, each divided in half by a dot. This dial was made from limestone, and it served as the model for another sun dial used in experiments to track shadow movement. (See Experiment section.) Photo supplied by: University of Basel / Public domain.

The concepts of minutes, and seconds which are part of our every-day experience were not developed yet when early sun clocks were in use. They were not necessary to mark the work day. However, as the North-South ranges of the shadow changed with the seasons it became possible with a sun clock to find the days of the year with the shortest and longest amounts of daylight, and darkness. The midpoints between these, counted in days, were the equinoxes. Ahaz and Hezekiah lived at a time when time-measuring was still primitive, but somewhat developed.

Whatever the *ma'aloth* were, steps or sundial divisions, we may be confident they were not subdivided into impractical, small increments. Subdivisions had to be of a useful, practical nature.

If the *ma'aloth* were steps on a staircase they may have been built intentionally for this purpose, or else the time-keeping function of the *ma'aloth* was an accidental consequence of its location and orientation. Israeli archaeologist Yigael Yadin hypothesized that *ma'aloth* were built into the lines of buildings as steps that could measure time by means of the moving shadow from the sun. This idea actually comes from a small, Egyptian sun clock. No separate gnomon is necessary for this kind of clock.

Below: Egyptian sun clock photo used under terms of **GNU General Public License**.

Right: Drawing from Y. Yadin. "The Dial of Ahaz" / אהז מעלות." *Eretz-Israel: Archaeological, Historical and Geographical Studies* / (1958): 91-96. Accessed May 6, 2021. <http://www.jstor.org/stable/23612438>.

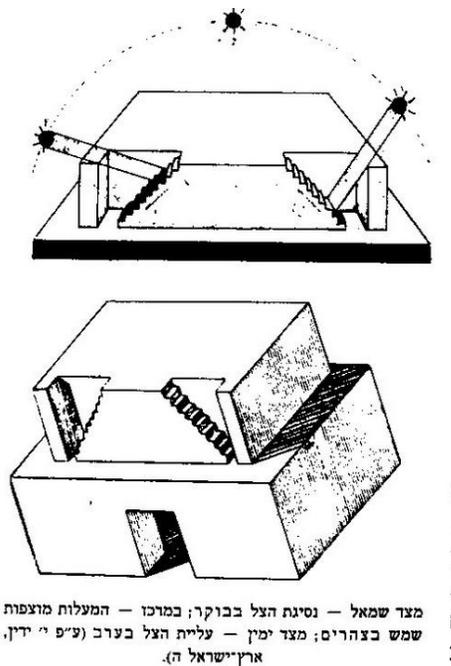
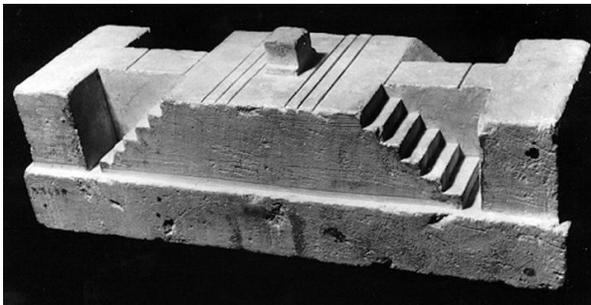
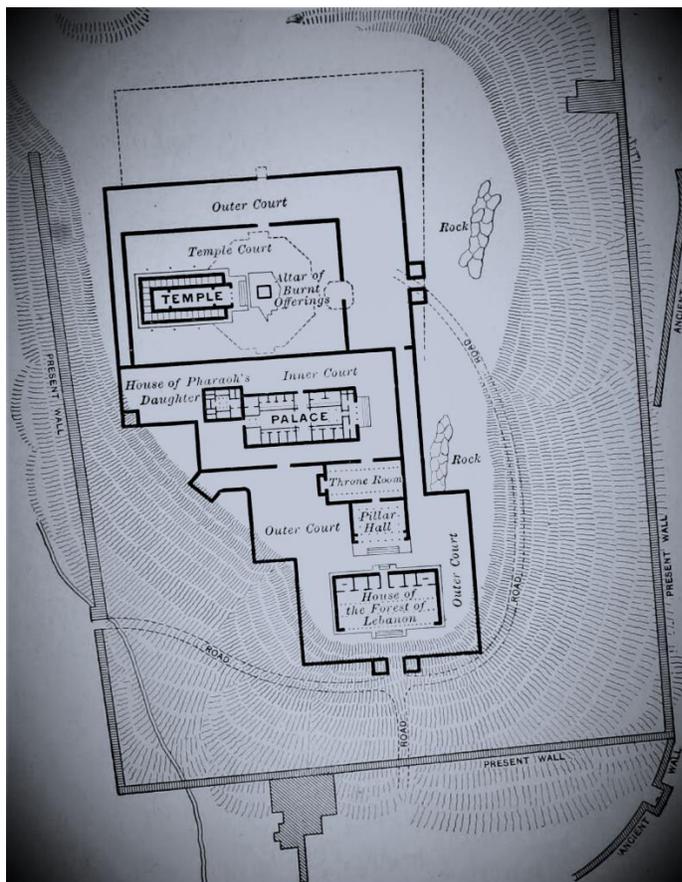


Figure 4.

If we look to the text for our information, the *ma'aloth* seem to be within view for Hezekiah and Isaiah as they are meeting in the palace. Hezekiah is confined there by his illness. The sign is to assure him that in three days he will be able to go up to the Temple, meaning he is too sick to leave now. If the sign of the moving shadow was only reported to Hezekiah by someone who saw it somewhere else, it would have lost some of its dramatic sign power. Hezekiah was to see it himself. That is the plain sense of the text.

With this in mind we can draw upon what is held by the great majority to be the locations of the palace and the Temple. The first royal palace stood on the northern end of the old City of David. To the north, and higher in elevation, was the threshing floor of Araunah the Jebusite. David had brought the Ark of the Covenant there to rest within the Tabernacle.

David's son Solomon replaced the Tabernacle with a permanent, grand Temple. He also built a new palace complex north of where David's had been. This palace continued to serve the kings of Judah in years to come until Hezekiah replaced it with another palace to the west. The Temple remained as the highest building, and at the highest elevation. *This means that whatever Hezekiah saw, he saw from his sick room in the palace. It must have been either in a courtyard of the palace, or outside the Temple.*



This is one of numerous drawings of the reconstructed Temple and Palace complexes in Jerusalem during the monarchy between the reigns of Solomon and Hezekiah. The Temple Court was higher in elevation than the Palace; someone in the palace should have been able to see the Temple Court to the north through windows. If the *ma'aloth* of Ahaz were something installed in the Temple Court, they should have been visible to Hezekiah and Isaiah in the Palace. If the *ma'aloth* were a kind of sun clock in the Palace Courts, they should have been visible from the Palace there as well. From: A History of all Nations from the Earliest Times; Being a Universal Historical Library, 1905. Author: Wright, John Henry, 1852-1908. Publisher: [Philadelphia, New York : Lea Brothers & Company. Contributing Library: University of California Libraries. Digitizing Sponsor: Internet Archive. No known copyright restrictions.

Figure 5.

We know of items Ahaz removed from the Temple in addition to changes he made to existing fixtures. There is only one addition to the Temple we know of ordered by Ahaz.

¹⁰ When King Ahaz went to Damascus to meet Tiglath-pileser king of Assyria, he saw the altar that was at Damascus. And King Ahaz sent to Uriah the priest a model of the altar, and its pattern, exact in all its details. ¹¹ And Uriah the priest built the altar; in accordance with all that King Ahaz had sent from Damascus, so Uriah the priest made it, before King Ahaz arrived from Damascus. ¹² And when

the king came from Damascus, the king viewed the altar. Then the king drew near to the altar and went up on it ¹³ and burned his burnt offering and his grain offering and poured his drink offering and threw the blood of his peace offerings on the altar. ¹⁴ And the bronze altar that was before the LORD he removed from the front of the house, from the place between his altar and the house of the LORD, and put it on the north side of his altar. ¹⁵ And King Ahaz commanded Uriah the priest, saying, "On the great altar burn the morning burnt offering and the evening grain offering and the king's burnt offering and his grain offering, with the burnt offering of all the people of the land, and their grain offering and their drink offering. And throw on it all the blood of the burnt offering and all the blood of the sacrifice, but the bronze altar shall be for me to inquire by." ¹⁶ Uriah the priest did all this, as King Ahaz commanded. 2 Kings 16:10-16

Might the *ma'aloth* of Ahaz have been the steps up to this altar? Certainly, this is only one hypothetical possibility. But combining Yadin's suggestion about steps with the altar from Damascus yields a possibility that would surely have been visible to anyone looking from the palace to the Temple.

Partial Solar Eclipse

The story of the sign involves a short time span. (1) Isaiah delivers the word from the Lord that Hezekiah will not survive his illness. (2) Even before he can leave the palace, Isaiah is sent back to Hezekiah with another message in answer to Hezekiah's secret prayer. (3) Hezekiah is told that he will be able to go to the Temple in just three days. (4) The sign for all this will happen now, not after those three days, or at some other future time. The plain sense of the text is that the sign took place then, just as soon as Hezekiah had made his choice about which direction the shadow should move on the steps, forward or backward.

The sign was the assurance that Hezekiah would live another fifteen years. With that our biblical investigation finds a most-important clue which allows us to move forward toward a further understanding of how this sign may have come about.

Hezekiah died in 687 B.C. Since the sign confirmed that Hezekiah would live fifteen more years, it would have occurred in 702 B.C. We discover that a partial solar eclipse was visible over Israel on March 5 of that year.

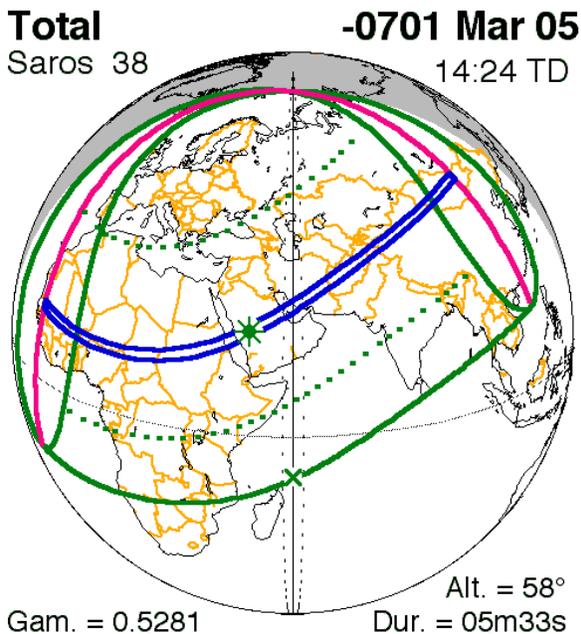
The Eclipse of March 5, 702 B.C.

On the 5th of March in 702 B.C., eclipse 03083 (the catalog number from NASA's Five Millennia of Solar Eclipses) subtracted 70 percent of the sun's light from the surface of the earth in Israel. The computer tools available to even the amateur sky student today allow recreating this eclipse on a screen, just as it happened. In Israel the greatest extent of the eclipse happened

shortly before midday. The sun was not high overhead, but about 45 degrees from the horizon. The direction of the moon's travel across the sun's surface was from west to east.

While there is no proof that this eclipse was involved in the sign of the moving shadow, the simple fact that it happened fifteen years before Hezekiah's death, coupled with the rarity and the wondrous nature of eclipses in general, makes this an event of great interest.

Might there have been a way that an eclipse could move the shadow backward on a sundial of some kind? The answer is: yes. See **A Simple Possibility** below. But this would require the number of *ma'aloth* between midday and early morning to be ten. If the sundial device, whatever kind it was, had ten divisions between midday and early morning, the change in light and shadow on these *ma'aloth* might be read as a retreat of the shadow ten *ma'aloth*. The stairs as suggested by Yadin appear promising here. Ten steps, as in his drawing, does seem to be a reasonable number for movement from one floor to another.



Five Millennium Canon of Solar Eclipses (Espenak & Meeus)

Figure 6.

This diagram shows the path of the March 5 eclipse. Source: Five Millennium Canon of Solar Eclipses, NASA. This site also provides the following information about the eclipse itself: From a vantage point in Jerusalem the intensity obscuration for this event was 64.5%; magnitude 0.708; altitude 45.6 degrees; azimuth 183.7 degrees; start of the partial eclipse 7:24:16 UTC; end of partial eclipse 10:02:48 UTC; maximum eclipse 8:41:55 UTC.

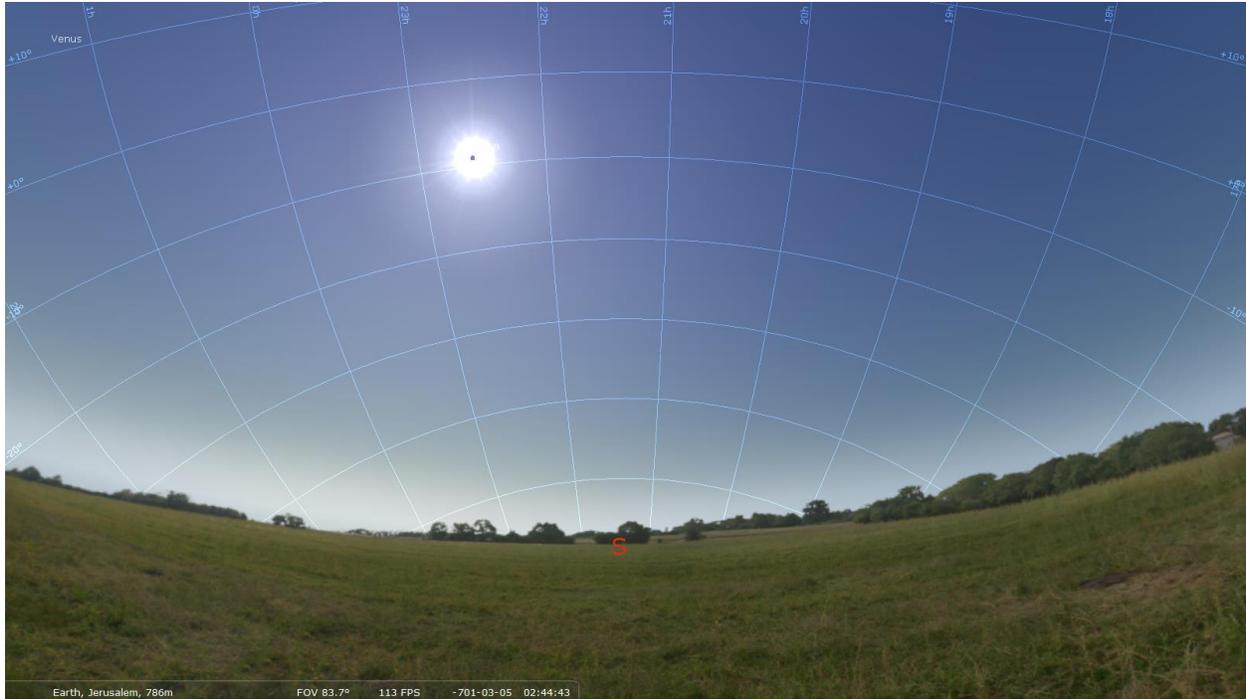


Figure 7. This illustrates the position of the sky at the greatest extent of the eclipse. Source: Stellarium.



Figure 8. This illustration is a Stellarium close-up of the March 5 eclipse at its greatest extent as seen from Jerusalem. The motion of the moon across the sun was from right to left, and slightly upward. About 70% of the sunlight was blocked from the earth due to the eclipse, but not from the areas to each side where parhelia might occur. See below. The article cited from Applied Optics offers proof that the return of post-eclipse sunlight and the appearances of parhelia are not necessarily simultaneous. In other words, sudden light source shifts are possible in these circumstances.

Parhelia

Another phenomenon of interest to us in this context is the parhelion, the sundog. These appear in the sky as false suns or rainbow sections which can be on one or both sides of the sun. They can be faint, and they can be bright. In optimum circumstances arcs of light appear with them, and additional false suns appear above and/or below the sun. Parhelia can appear anywhere on earth at any time of year, though they are rare. They are more typically seen closer to the poles, because they are formed by ice crystals in the upper atmosphere. The optical physics which produce parhelia are constant, as one would expect. Each false sun will be twenty-two degrees from the real sun. So, the arc of the sky encompassed by two parhelia is forty-four degrees.

Parhelia can be extremely bright. I have observed this personally; I remember a time when I was outdoors playing as a child. The sun seemed brighter than it had ever been, and I looked up to see three of them that were indistinguishable in brightness.



Figure 9.

Here is one striking example of parhelic circle with bright lateral parhelia.

Credit: NASA/Lora Koenig, Public Domain

Figure 10.

The German words on this painting from a book published in 1550 say: "In 1533, three suns shone similarly as if they had fiery clouds around them, and they stood over the city of Münster, as if the city and the houses were burning, as painted here."

— in: *Augsburger Wunderzeichenbuch* —
Folio 131, c. 1550

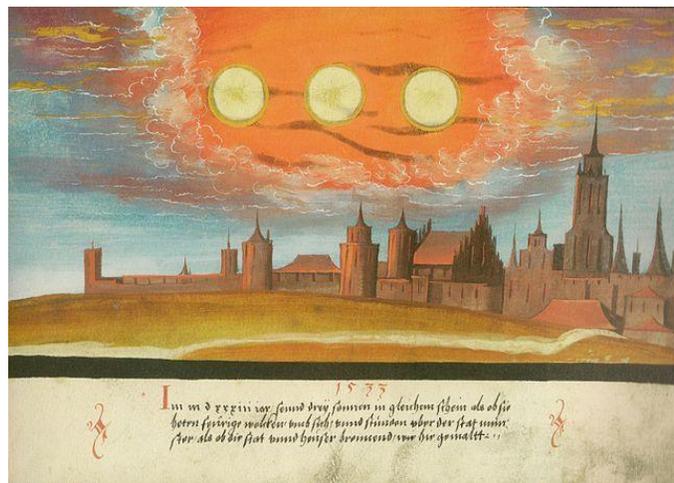




Figure 11. This photo was taken with a camera oriented vertically at the Dead Sea, demonstrating that a parhelic circle can form in the most unexpected places, including Israel. Photo courtesy Koby Harati.

On March 27, 1703, parhelia were reported to change the shadow on sundials in Metz, France. Hampshire, England, experienced a similar phenomenon on March 28, 1848. The time change indicated on the sundials was one and one half hours each time. (Bible Fellowship Union, Bible Study Monthly vol. 85, no. 3, May 1, 2008). It is interesting that both these events are reported to have happened in March, like the 702 B.C. eclipse. While not a cold winter month, March still offers opportunities for cold atmospheric conditions at high altitudes.

If parhelia appeared over Jerusalem resulting in multiple light-source directions simultaneously upon the *ma'aloith* of Ahaz, we must recognize that this could have been part of the mechanism of the miracle.

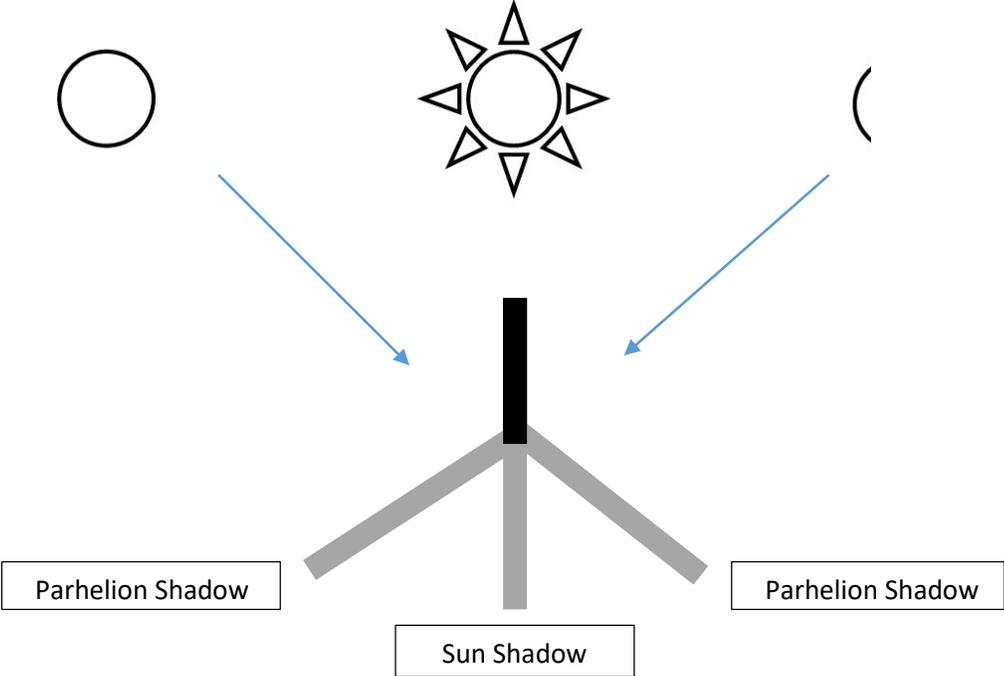


Figure 12.

A Simple Possibility

We can say this much with simple certainty: If a solar eclipse suddenly darkens the surface of the earth, the returning light that comes immediately afterward will restore shadows to where they appeared before. If the sun had moved to a place where its shadow fell ten *ma'aloith* from the beginning of the scale when a solar eclipse occurred, the result would be experienced as (1) normal shadows on the *ma'aloith*, (2) the shadows of early morning returning, overtaking all the *ma'aloith*, and (3) the shadow returning the ten *ma'aloith* to where it had been before. This is one simple explanation of how the sign might have happened. This particular means of reversing the shadow would seem possible on any type of sun clock, providing that ten divisions comprised the distance between the late morning eclipse and the early morning or late evening shadows. But this seems too simple an explanation for the shadow sign.

Eclipse with Parhelia

There is a further possibility to consider, the combination of parhelia with a solar eclipse. Why complicate the investigation this way by supposing something so rare? The answer will become apparent. The effect of a solar eclipse happening simultaneously with a parhelion has now been observed, studied, and photographed. (See: Gunther P. Können, Glenn Schneider, Evan H. Zucker, and Panu Lahtinen, "Subsuns and rainbows during solar eclipses," Applied Optics 59, F1-F10 [2020] © The Optical Society. Adapted with permission.)

This parhelion was actually below the sun in this case, a subsun, but it was caused the same way as a lateral parhelion as ice crystals refracted sunlight. It appeared as a subsun because the vantage point from which it was photographed was an aircraft at high altitude so that the location of ice crystals which caused the subsun was in a clouds appearing below the sun.



Fig. 12. Top: pretotally. The white spot straight under the Sun is the subsun. The dark patch on the clouds under the Sun is the rapidly approaching lunar umbra. The green spot is an artifact due to internal reflections in the camera lens (frame ID #3668, taken 28 s before totality). Bottom: During the final moments of totality, the subsun reappeared superimposed upon the clouds below that are already directly lit by the solar photospheric light (frame ID #3734, taken 2 s before totality ended). Pictures taken by Evan Zucker, 9 March 2016 (UTC); horizontal field of view is 115°. (Reproduced from: Gunther P. Können, Glenn Schneider, Evan H. Zucker, and Panu Lahtinen, "Subsuns and rainbows during solar eclipses," *Applied Optics* 59, F1-F10 [2020]).

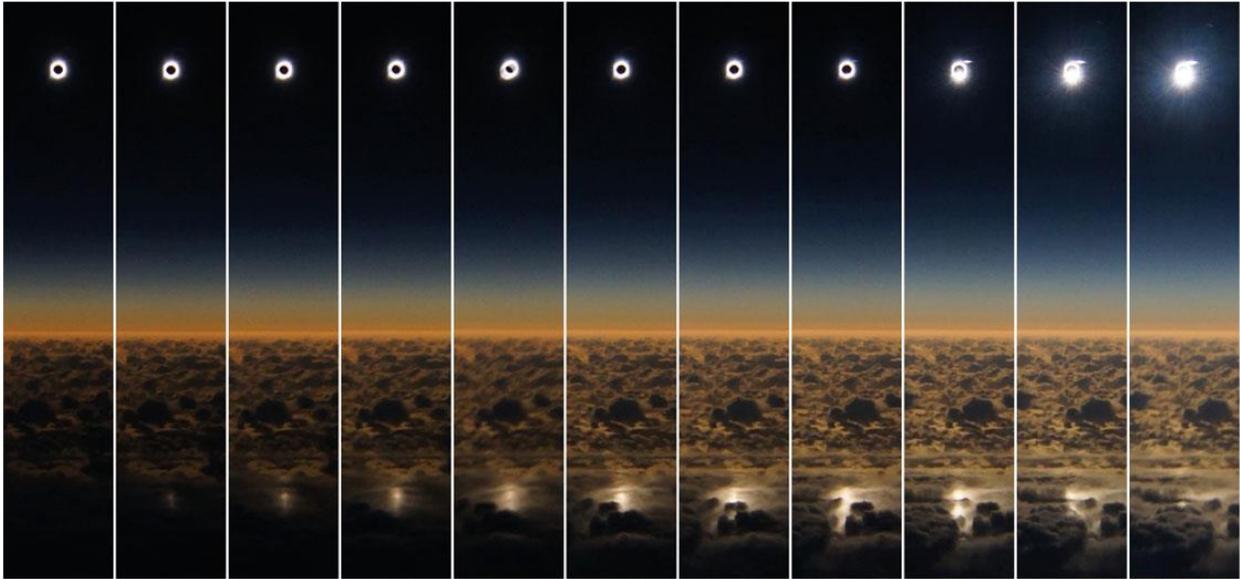


Fig. 13. Shortly before the end of totality, the light returns at the subsun point. Third contact (C3) occurs at the eighth frame of this composite consisting of 11 frames. The individual frames are mutually separated by 2 s; the 20 s sequence runs from C3–14 s until C3 + 6 s (frame ID #s 3728–3738). At this aircraft height (10.7 km), the horizon is depressed by $\approx 3.2^\circ$ and is thus angularly closer to the subsun point than to the Sun. With the Sun 10.1° above the true horizon at C3, the line-of-sight distance from the aircraft to the subsun point at sea level is ≈ 62 km. (Reproduced from: Gunther P. Können, Glenn Schneider, Evan H. Zucker, and Panu Lahtinen, "Subsuns and rainbows during solar eclipses," *Applied Optics* 59, F1-F10 [2020]).

As the sun disappeared behind the moon, *the subsun still momentarily shone*. A light source other than the sun was shining from a different direction as the sun went dark. Let's transfer that idea to a parhelion horizontal from the sun as seen on the ground. Bear in mind that the eclipse of March 5, 702 B.C., was partial, not total. But the same optical physics should apply to parhelia, even if the sun was not completely eclipsed by the moon. *In other words, a darkening of the eclipsed sun would not necessarily eliminate the sun-related light sources to the sides of the sun, and the shadows they cast on the ground from their angular distances. Changes in shadow placements might last for multiple seconds or minutes.*

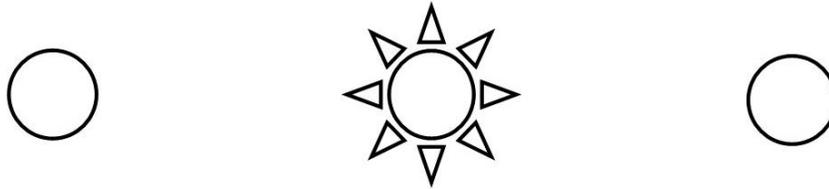


Figure 14. The sun with parhelia at 22 degrees to each side.

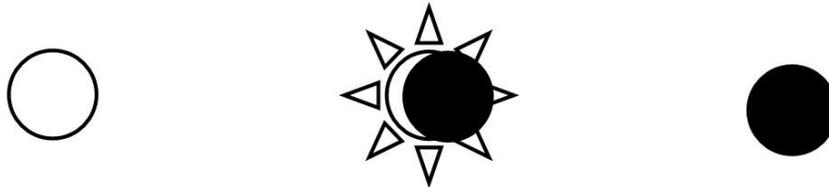


Figure 15. The sun being eclipsed by the moon during parhelia conditions. The encroaching shadow from the moon disc blocks the parhelion on the right. One light source only now shines on the earth, 22 degrees from the left of the sun. The shadow swings 22 degrees on the ground from where it had been when the sun was the primary light source. This would bring the shadow backward, rather than forward, as requested by Hezekiah.

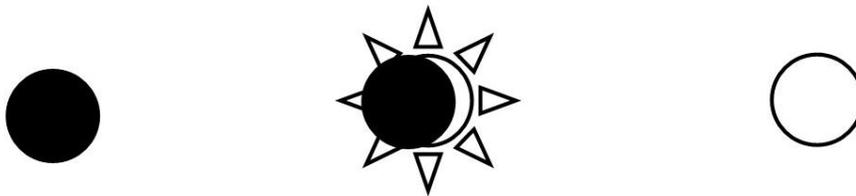


Figure 15. As the moon disc continues to cross the sun, the right parhelion is no longer blocked while the left parhelion becomes blocked. Suddenly the light source on the ground is from 22 degrees right of the sun, 44 degrees from where the other parhelion had just shone. The shadow on the ground swings to the left, 22 degrees from where the sun's shadow had just been, and 44 degrees from where the other parhelion's shadow had been.

Experiments

Experiments were performed to study the phenomenon of the retreating shadow with different models of sun clock devices. Care was taken to photograph the models at the appropriate times corresponding with the positions of the false suns, and the real sun. Below are some of the results of these experiments.

Eclipse alone

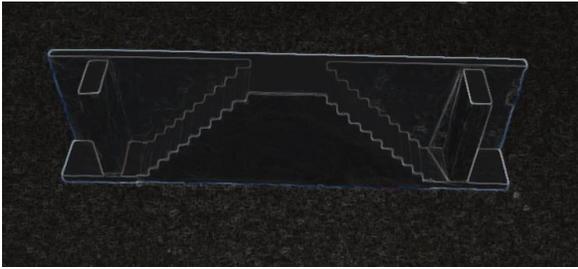


Figure 16. Stairway.

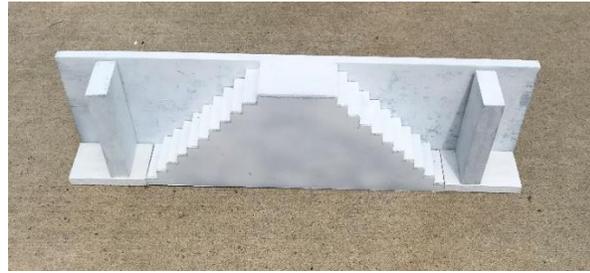


Figure 17. (same as left photo in Figure 19.)

The stairway model did not produce a ten-step shadow change from the parhelia angled light sources, but it still fulfills the ten-step change in another way, provided there are ten steps on each side as in Yadin's drawing. As the eclipse stopped the sunlight at 12:40 P.M., the entire stairway suddenly took on the shadows of early morning; it was engulfed in darkness (**Stairway Figure 1**). Then, with the return of the sunlight following the eclipse, the steps appeared again as they had in **Stairway Figure 2**, at 12:40 P.M., mid-day. This would have fulfilled the requirement of the retreat of the shadow ten steps from mid-day back to early morning, but it is not a convincing explanation.

Eclipse with parhelia

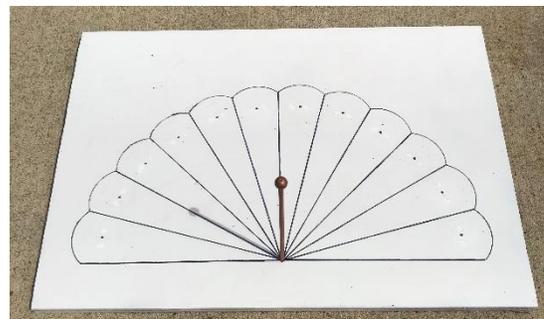
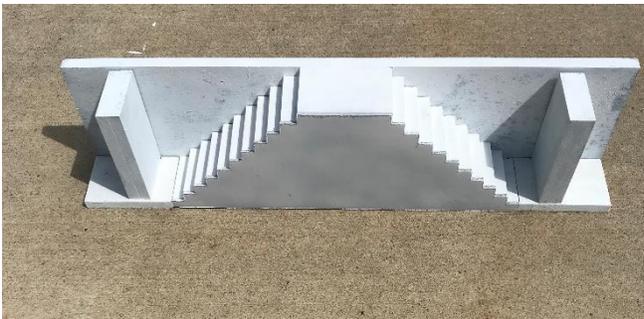


Figure 18. Models of the ten-step stairway and the Egyptian-style vertical gnomon sundial photographed at 11:10 A.M., with light direction from the location of the eastern false sun.

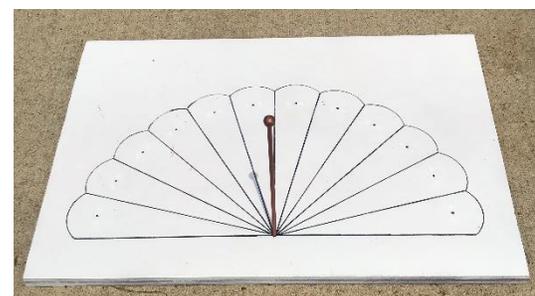
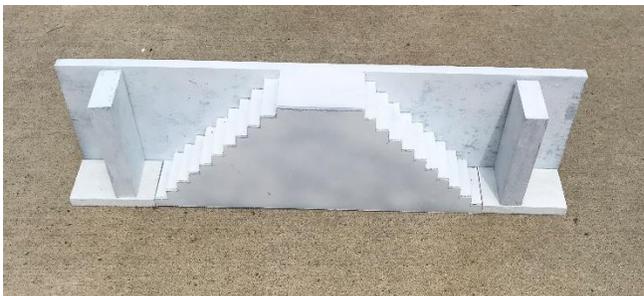


Figure 19. Models photographed at 12:40 P.M., with light direction from the actual sun, the partial eclipse in progress.

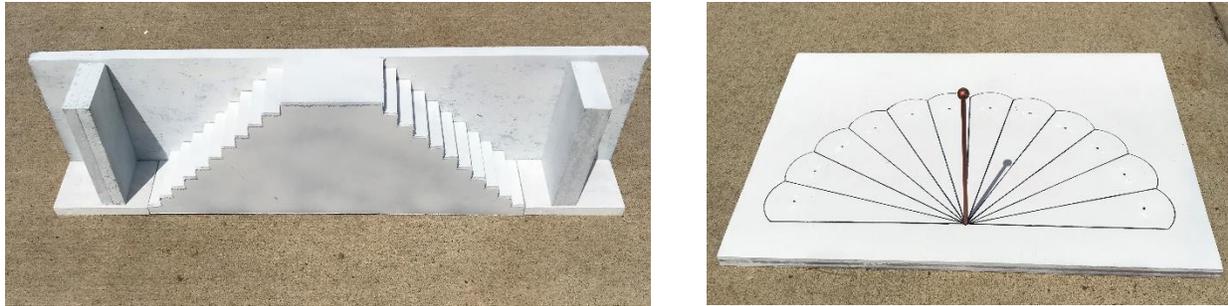


Figure 20. Models photographed at 2:10 P.M., with light direction from the direction of the western false sun.

Some Findings

The Egyptian-style sundial would have registered shadows in the order of **Figure 20**, **Figure 18.**, and **Figure 19**. This is because the moon crossed the sun from the west, first cutting off the sunlight forming the western parhelion, and leaving the eastern parhelion to shine. As the moon passed the sun, the reverse happened—the light to the eastern parhelion was cut off, leaving the western parhelion. The resulting swing in the shadow was backward on the dial. The Egyptian sun clock after which this model was made has twelve one-hour divisions, with a dot in each division to divide it in half. **The shadow swing comprises ten of these half-hour segments. Under our simulated conditions of partial eclipse with parhelia, the shadow did in fact go backward ten divisions on a sundial known from that time.**

A Most Interesting Discovery



Figure 21. The Hezekiah bulla discovered by Professor Eilat Mazar of the Hebrew University's Department of Archaeology in 2015. Notice the ankh symbols, the downturned wings, and the three objects beneath the sun.

In 2015 Professor Eilat Mazar recovered a small seal from the Ophel area in Jerusalem, just south of where the First and Second Temples stood on Mt. Moriah. The seal was only one centimeter across. It was used to stamp clay with an impression identifying its owner; this is how scrolls were sealed as a wet clay ball would be formed over cords tying the scrolls closed. A winged sun disc appeared on the seal, with an ankh symbol on the right and on the left, the ankh being the symbol for life. Three straight items protruded from the sun as though the sun were on top of them. They appeared to have ball-shaped lower ends.

The name on the seal was at first misread. It was carefully stored, and only later did archaeologists realize that the letters actually said: Belonging to Hezekiah, son of Ahaz, King of Judah. This was not the first Hezekiah seal claimed to have been found, but it was the first whose chain of custody was proven to originate in an archaeological setting. The rest came from antiquities dealers and could not be absolutely proven authentic.

Now there could be no doubt that Hezekiah lived as a real King of Judah, just as the Bible says. Close to this seal another was discovered, the seal of the prophet Isaiah!

Other seals believed to belong to Hezekiah carried a different symbol, a dung beetle with wings circling upward around the edge. Something apparently caused Hezekiah to change his symbol at a particular point in his life. The ankh symbols—two of them, not just one—suggest that Hezekiah wished to emphasize or celebrate his life. That might be expected from one who came close to dying from an incurable illness.

It has been observed that the wings of the sun disc on the seal are pointed downward, which is unprecedented for the winged sun disc symbol. Can this be unintentional, or does this also represent something, such as the perceived backward motion of the sun? Of course, we cannot know that these interpretations were intended by Hezekiah, representing his gift of fifteen more years of life. However, the three straight items coming from underneath the sun disc are in the same configuration as the shadows on a gnomon-style sundial at the times of approximately noon, and ninety minutes before and after noon, just as our parhelia proposal requires. The claim that these lines are rays fails to explain their overlapping, and the round objects on the lower ends. A ball at the end of a gnomon at least gives us some answer as to why these balls are present. Rays in Egyptian art have points rather than round ends.

What it Means

Have we simply “explained away” the miracle of the moving shadow by referencing a solar eclipse and rare atmospheric conditions? Absolutely not! God knows what we need before we ask, and begins to answer our requests already then (Isaiah 65:24; Matthew 6:8). God can arrange events, time events, orchestrate events long in advance, and guide humans to the particular moment and place to observe his works. Make no mistake about this attempt to discover the “how” of an act of God. If this was indeed how God brought about the movement of

the shadow on the *ma'aloith* of Ahaz, it must be seen as a most exquisite and extraordinary supernatural use of the natural. It remains a miracle, nothing less.

What we have done here is to put the person who would deny this biblical account in the uncomfortable position of being unable to do that now. There can no longer be any doubt that Hezekiah was a real individual, and no longer a doubt that a solar eclipse happened some fifteen years before Hezekiah died. Even the most ardent skeptic cannot deny these facts. Further, we have shown the extreme plausibility of a combination of parhelia with a solar eclipse resulting in a backward-moving shadow, just as in the biblical text.

Having found a solar eclipse in the right year to lend support to the biblical story, and having gathered information about this eclipse available to us from NASA, we have been able to reproduce a backward movement of a sundial shadow to match that in the biblical account by applying optical mathematics. The combination of eclipse and parhelia answers all requirements. A common sense evaluation of these facts yields: that is likely what happened.

No one in the world could yet predict eclipses in Hezekiah's day. Isaiah had no way to know of this phenomenon in advance. The setting of all the necessary conditions, as well as the timing of the events testify to a miracle God arranged in advance.

Let everyone also remember that Hezekiah was instantly healed of a fatal disease. Let us further remember that the Lord preserved Jerusalem against the world's mightiest army, which no other army had been able to stop. The shadow sign was itself a miracle, but so were these two events the sign promised.