On the astronomical orientation of the Hardknott Fort

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Published in enviro.philica.com

Abstract

Among the remote Roman forts, which were situated at extreme points of the Empire, we find the Hardknott Fort. Located on the western side of the Hardknott Pass in the English county of Cumbria, this fort possesses a remarkable symbolic layout, as we have shown in a previous article (Philica, Article n.442). Here we are add, after a short preamble on Roman forts and colonies, some considerations and remarks on the astronomical orientation of the fort. A further alignment along the noon of the winter sun is discussed.

Keywords: Archaeoastronomy, Roman forts, Roman Empire, Google Earth.

In [1], we can find pictures and descriptions of some remote Roman forts, that were situated at extreme points of the Empire. Among them there is Mediobogdum, known as the Hardknott Roman Fort, which is located on the western side of the Hardknott Pass in the English county of Cumbria. The fort was built between about 120 and 138 to protect the Pass, but abandoned during the Antonine advance into Scotland. We can see it "on a rocky spur", which is giving "a superb view over the River Esk in both upper and lower Eskdale" [1]. In addition to being located in spectacular position, this fort possesses a remarkable symbolic layout, that we have discussed in a previous article [2]. Here we are adding to the discussion given in [2] - after a short preamble on Roman forts and colonies - some considerations and remarks on the astronomical orientation of the fort. A further alignment along the noon of the winter sun is discussed.

The remote forts mentioned in [1] were a few of the many fortifications that the Romans built to protect their Empire. All the forts built by the Romans were representing Rome in the conquered territory, and each fort or colony was founded like Romulus founded the first Rome. As told by Dionysius of Halicarnassus and Solinus [3], Romulus planned his town as a quadrangle, and for this reason, she was known as the Roma Quadrata. And then, many Roman forts are quadrangles, with the space inside subdivided in four quadrants by the perpendicular streets of the Decumanus and the Kardo.

Let us note that, in Latin, a military fort is a 'castrum'. This word is coming from the Proto-Italic kastro- which means ‘part, share’, and perhaps related to the verb 'castrare' via notion of ‘cut off’, as explained by Douglas Harper, in his Online Etymology Dictionary, www.etymonline.com/. Therefore, a castrum was a reservation of land ‘cut off’, that is, limited, for military use. It was a plough, pulled by a pair of oxen, which was cutting and dividing the land during the foundation.

It was from the most ancient times, that the Roman castra were constructed according to a regular layout pattern, that, as previously told, was based on Decumani and Kardines. Sometimes it happens to read that in Roman town or military camps, a "decumanus was an east-west-oriented road" [4], and that a Kardo was "a north-south street" [5]. Indeed, it is not so. In the book of Francis John Haverfield on the ancient town-planning [6], we find that the Decumani were determined to have their direction aligned along the azimuth of the rising sun. The Decumanus points, "where the sun rises above the horizon on the dawn of some day important in the history of the town" [6]. Since the sunrise azimuth changes during the year, the Decumani have different orientations, and therefore, in general, they are not east-west-oriented roads. Consequently, the Kardo which is perpendicular to the Decumanus is not a north-south oriented street.

By means of satellite images or maps and software giving sunrise azimuths, it is possible to check if a Roman town or castrum had a solar orientation, according to sunrise (but also sunset) azimuth. It is remarkable the presence of towns with the Decumanus or the Kardo, aligned along the sunrise/sunset solstices, as discussed in [7,8]. In the case of Verona and Como, the decumani could had been oriented along the sunset azimuth. In [9], it is explained that, as observed by Adriano Gaspani (Osservatorio Astronomico di Brera), Roman augurs decided a planning of Como towards the sunset of winter solstice, according to a solstice orientation proper of Celtic cultures. In the case of Rimini, it is the Kardo, not the Decumanus, being oriented along the sunrise azimuth on summer solstice [7].

In the case that the layout of the Roman fort or colony has the Decumanus or the Kardo, oriented according to sunrise/sunset on solstices, this layout can be seen as a powerful symbol. It can be considered an emblem of the power of Rome to control Earth and Heavens. The square or rectangle inside the perimeter represents symbolically the Earth, and the perimeter is the horizon. The directions of the main streets are evidencing the motion of the sun with respect to the local horizon. In this symbolical framework, the horizon is not necessarily coincident with the natural horizon.

In fact, two horizons exist. One is the astronomical horizon, which is the horizon that would be seen if the earth's surface were perfectly smooth. It is given by the intersection with the celestial sphere of the local horizontal plane which is passing through the observer. The second horizon is the natural or sensible horizon, that is, the line at which the sky and Earth appear to meet. If we are considering the Roman fort or town representing the sacred space of Rome and her control on Earth and Heavens, it is possible to imagine that its Decumanus was oriented along the azimuth of the sunrise, given according to the astronomical horizon, and not according to the natural horizon.

After this preamble, let us consider the Hardknott Fort. Why is it symbolically interesting? Because it is a very small Roma Quadrata, placed at the latitude where the directions of sunrise/sunset on solstices are perpendicular, exactly as Decumanus and Kardo are. Therefore, at the Hardknott Fort, Decumanus and Kardo are not east-west and north-south aligned streets, but are aligned along sunrise/sunset azimuths on solstices. In my opinion, the square layout of the fort and its perimeter was representing the astronomical horizon. And therefore, that it was not necessary to observe really the sun rising and setting there.

In the Figure 1, we see the Hardknott Fort and the azimuths of sunrise/sunset on solstices. The azimuths were determined by means of software SunCalc.net.

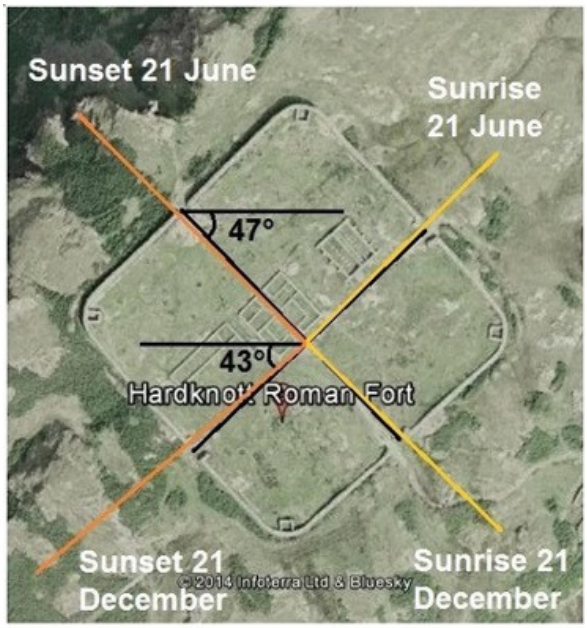

Figure 1 – The Hardknott Fort and azimuths of sunrise/sunset on solstices. The four towers of its wall seem almost aligned to cardinal directions.

However, we could ask ourselves if the sun, at sunrise or sunset, is visible from the fort. To answer, we have to consider the natural horizon, and Google Earth can help us in this task. First, we can use the elevation profile tool. We consider two long straight lines having the same directions of Decumanus and Kardo and the corresponding elevations profiles. They are given in the Figures 2 and 3.

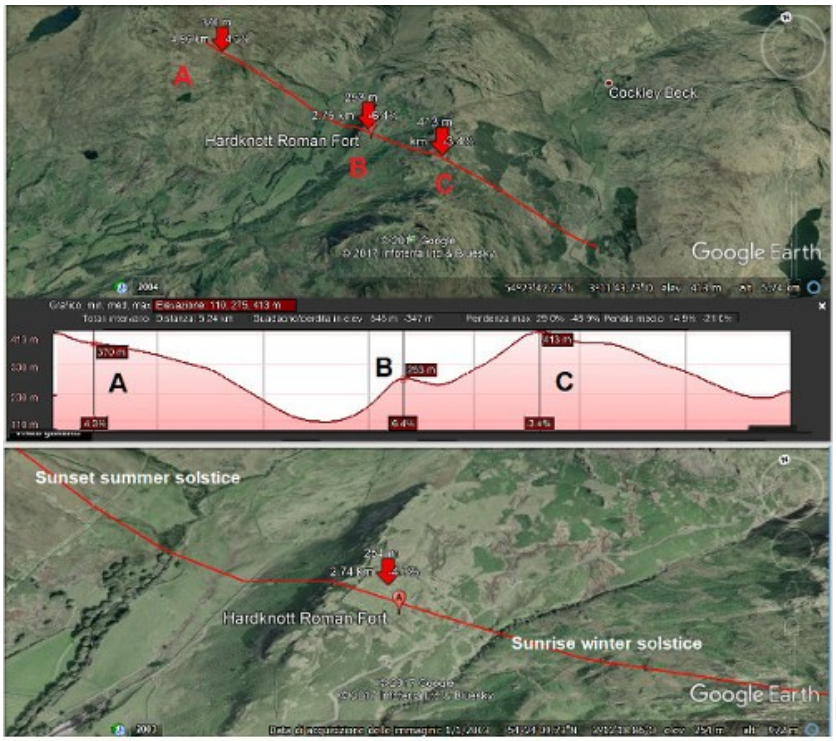

Figure 2: Elevation profile given by Google Earth in the directions of sunset on summer solstice and sunrise on winter solstice.

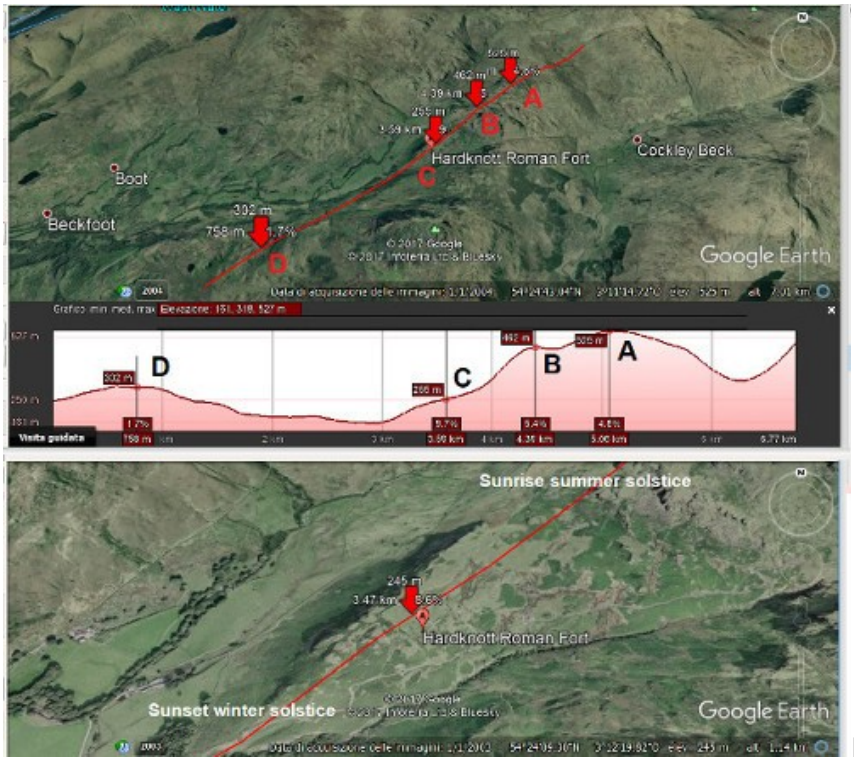

Figure 3: Elevation profile given by Google Earth in the directions of sunset on winter solstice and sunrise on summer solstice.

From the profiles, we can deduce that the sun is visible at the sunset on the winter solstice. We can further evidence this fact by means of the sun tool of Google Earth. In the top toolbar of this program we can find a sun icon. To this icon corresponds a slider to change the date and time. We can see the sun moving across the sky and cast shadows on the landscape. The results are shown in the Figures 4 and 5, for the four above mentioned directions. From these two figures, we have that the direction which is relevant for the natural horizon is that of the sunset on winter solstice. Actually, this alignment is remarkable, as given by the lower panel of the Figure 5.

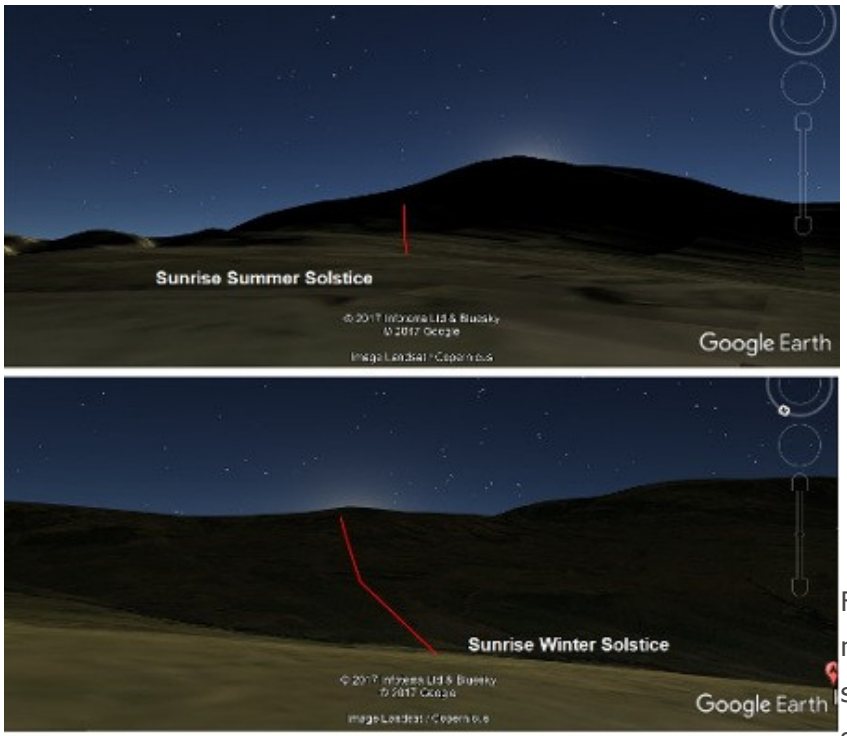

Figure 4: Landscape simulation by means of Google Earth at the sunrise on summer and winter solstices.

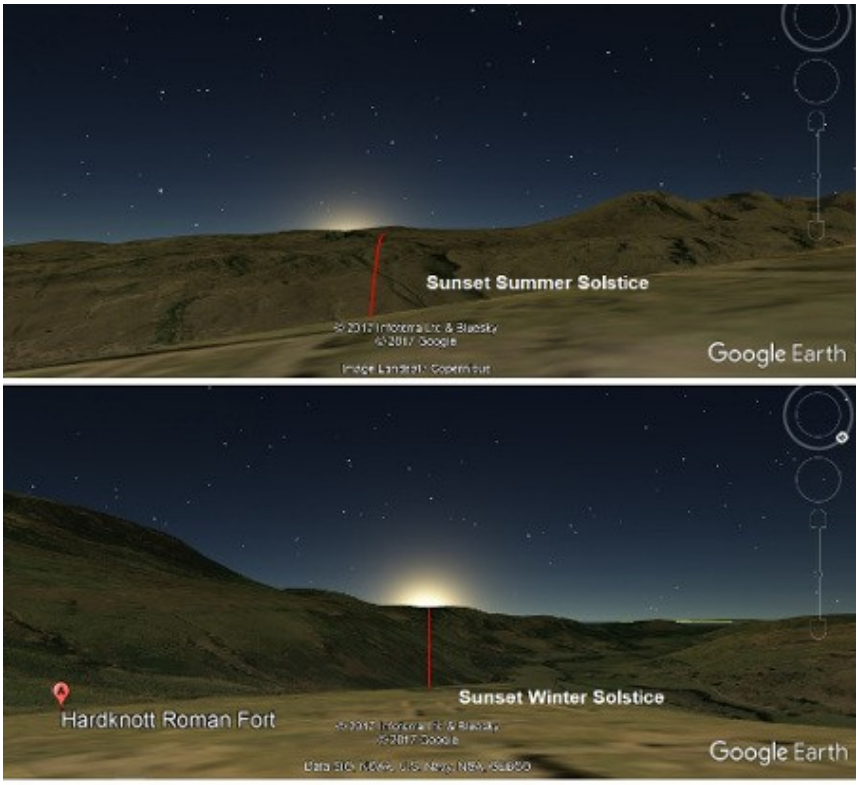

Figure 5: Landscape simulation at the sunset on summer and winter solstices.

In [10], Owen Jarus, Live Science contributor, described this Roman fort as designed for a celestial show according to the rule "Let in the Light". And this was the rule of many ancient architectural complexes, showing hierophanies linked to the sun [11]. For the Hardknott Fort, to the alignments along sunrise/sunset on solstices of the gates (three of them based on the astronomical horizon, and one, that along the sunset on winter solstice, based on the natural horizon), we have to add another significant alignment. For this alignment is fundamental the natural horizon. Let us consider the noon direction of the sun, and remember that the fort has one of its diagonals in this north-south direction. Facing south, on the winter solstice, an observer can see the sun that moves on the natural horizon as shown by the simulation obtained by means of Google Earth given in the Figure 6.

As evidenced by Figure 6, the Roman fort was able to see the sun at noon each day of the year, since it is visible on winter solstice. As a conclusion, I would like to stress that this fort had a symbolical square layout, linked to the astronomical horizon and the latitude of the place. Therefore, symbolically, the sun was rising and setting on solstices passing through the gates of the castrum. If we consider the natural horizon, in the case of the winter solstice, the sun can really light up the south-west gate. Another remarkable show of the sun is that linked to its motion during the shortest days of the year, that we have here proposed by means of Google Earth in the Figure 6.

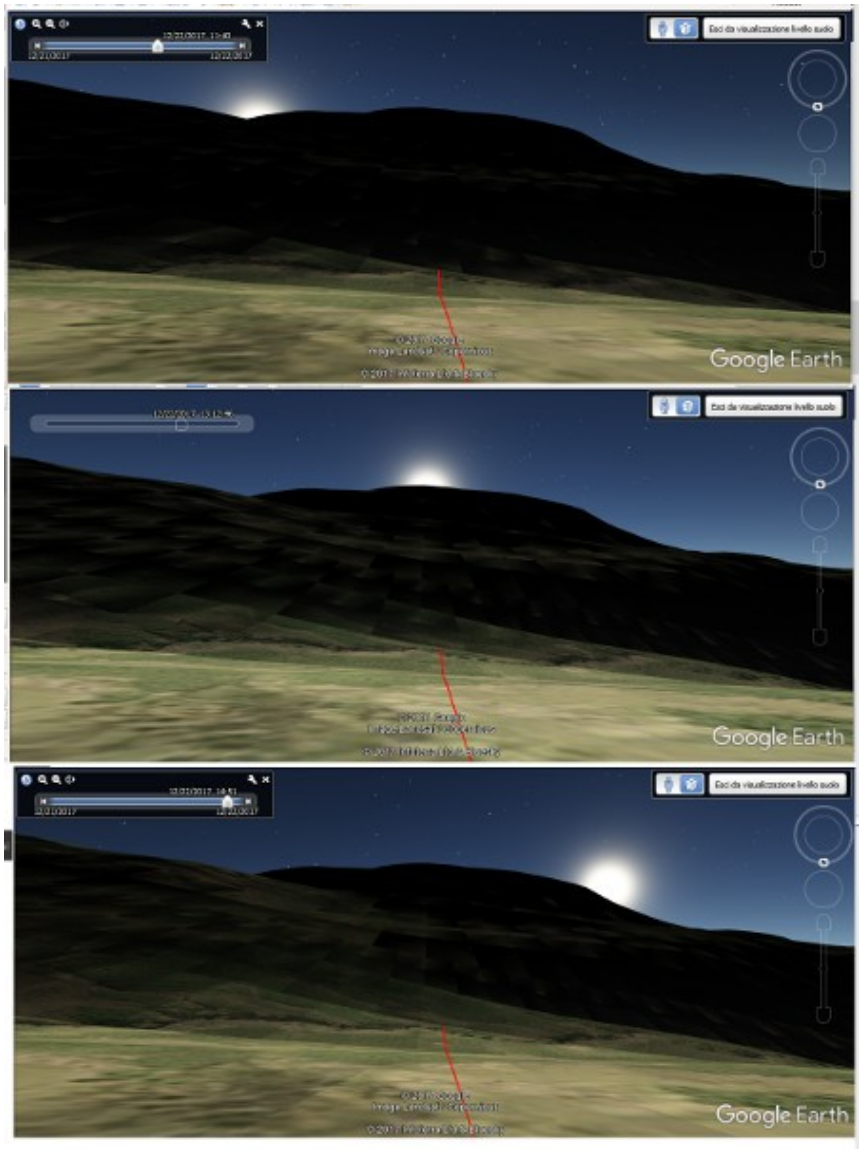

Figure 6: Thanks to Google Earth, using the tool corresponding to the sun icon, we can imagine an observer facing South, observing the sun moving close the natural horizon, on the winter solstice. The noon is given in the middle panel.

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Information about this Article

Published on Saturday 23rd December, 2017 at 17:04:05.

The full citation for this Article is:
Sparavigna, A. C. (2017). On the astronomical orientation of the Hardknott Fort. *PHILICA Article number 1196*.