Evidence for Precise Calendrical Observations in the 17th Century at the `Bruchhauser Steine´, Olsberg, Northrhine - Westphalia, Germany

Burkard Steinrücken

Ancient Astronomy Research Project
Westfälische Volkssternwarte und Planetarium Recklinghausen, Stadtgarten 6,
D-45657 Recklinghausen, E-Mail: steinruecken@sternwarte-recklinghausen.de

Abstract
Evidence for visual calendrical observations in the landscape surrounding the `Bruchhauser Steine´ is presented. Recent archaeoastronomical discoveries let assume a sophisticated system of observation sites of arcminute accuracy applying the large volcanic rocks on the `Istenberg´ as astronomical foresights of apparent solar and lunar size.

Key words: history of astronomy – archaeoastronomy – astronomy in culture – ancient astrometry – calendar – solstice - lunar standstill

---

The `Bruchhauser Steine´, four large rocks of volcanic origin in the southern part of Westphalia, form perfect foresights for calendrical observations from the surrounding landscape up to a distance of 4 km (fig. 1). The ancient walls and embankments on the `Istenberg´ with the rocks as cornerstones were built 500 BC (5 radiocarbon dates range from 627 to 374 +/-130 cal. BC).

In the landscape are placed shrines with images of christian saints, erected in the late 17th and the early 18th century. The positions of these shrines can easily be interpreted as astronomical observation sites with respect to the large stones. The foresights reach several degrees to the sky, so daily and seasonal variations in the astronomical refraction are strongly suppressed.

The most impressive observation site with a shrine devoted to the Saint Antonius of Padua (erected 1699; 8°31´13´´East, 51°18´49´´North, distance to foresight 1,8 km) is exactly at the position to observe the summer solstice sunrise at the topmost rock, the `Feldstein´ (fig. 2). The solstice sun rises between two stones and grazes the Feldstein at 6:20 CEST (fig. 3). The sun is covered 2´ - 3´ by the stone (fig. 4). In bright sunlight this is detectable with a camera obscura. Taking into account the slight variation of the obliquity of the ecliptic in the last three centuries of 2´ the grazing procedure at the time of erection was perfect, without any occultation of the solar disc.

A similar shrine for Saint Nikolaus is placed at a position to observe the sunrise on May 1st in the identical manner (8°29´39´´E, 51°18´41´´N, distance 3,6 km, fig. 4). In subsequent years on May 1st the occultation of the sun by the Feldstein grows by 4,5´ due to the noninteger duration of the solar year of 365,2422 solar days. During the basic leap year cycle of four years the sun´s occultation will rise annually until the additional 366th day in the leap year 2004 again fixes the average path of the sun´s lower edge on May 1st to the Feldstein profile. So the necessity of the basic intercalary rule with an additional day every fourth year can be discovered at this site in a few years.

At an impressive site to observe the lunistice at the extrem southern declination limit -(e + i + D) every 18 - 19 years with the foresights on the meridian is placed the shrine of St. Stephanus (erected 1682, 8°32´44´´E, 51°20´33´´N, distance 2,4 km, fig. 5). At its lowest possible path the moon grazes along three stones while transiting the meridian. The calculation of the solar and lunar path in figure 5 is for 1671 with e = 23°29´, i = 5°9´, D = 9´ (perturbation of the inclination) and includes average parallax and refraction. The next lunar events of this type are observable on Oct 9th 2005, 17:19; Feb 23rd 2006, 8:09; Apr 19th 2006, 4:53; Sep 2nd 2006, 19:47; Sep 29th 2006, 17:37 (absolute minimum for this site during the major lunar standstill season of 2005/2006). All transit times in Central European Time CET.

Figures:

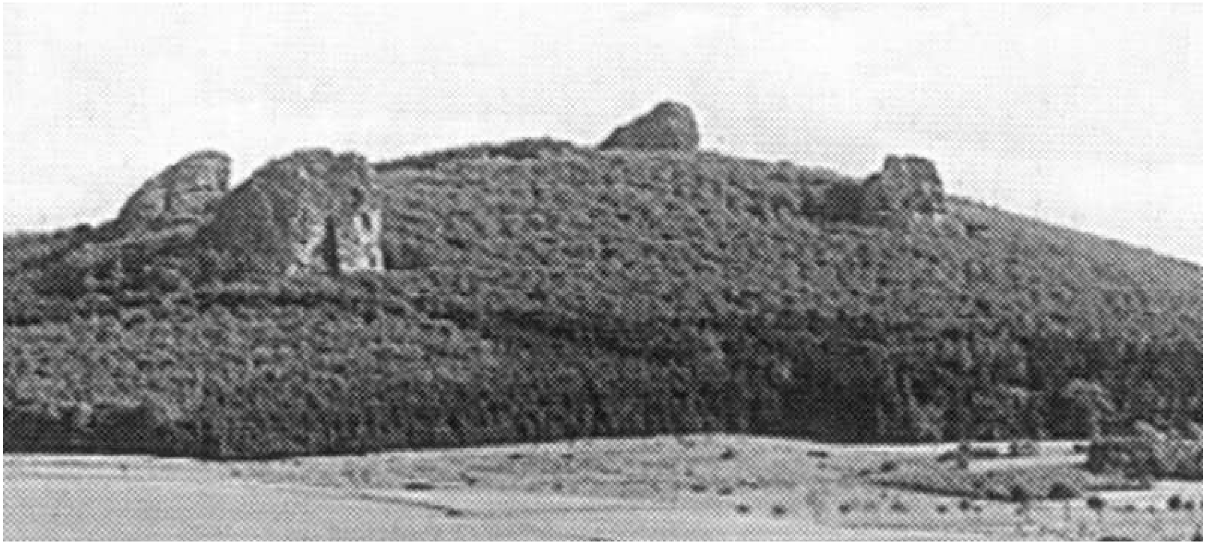

Figure 1: The `Istenberg´ with the four large rocks `Goldstein´, `Bornstein´, `Feldstein´ and `Ravenstein´ (from left).

Figure 2: At summer solstice the sun rises between two stones and approaches the Feldstein.

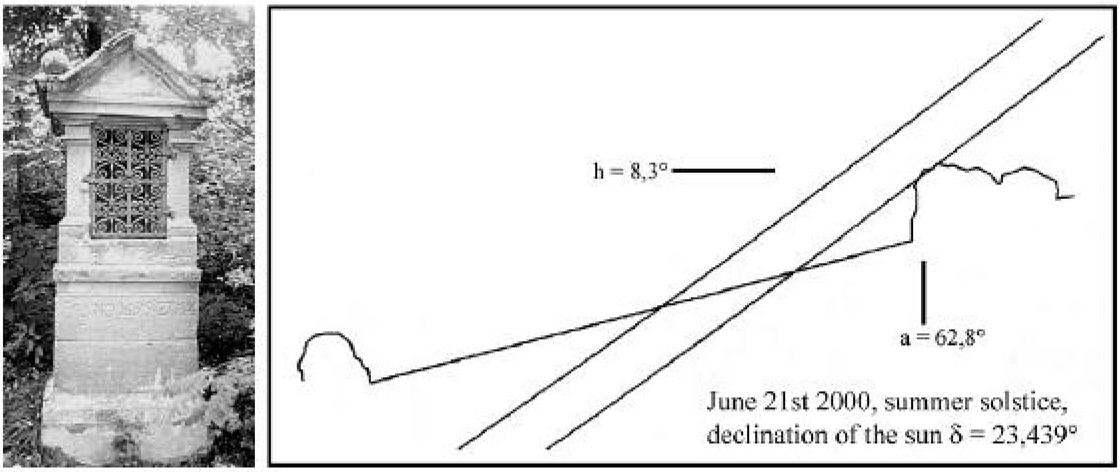

Figure 3: Calculated path of the sun on June 21st 2000 including average refraction (the accuracy is 1´-2´).

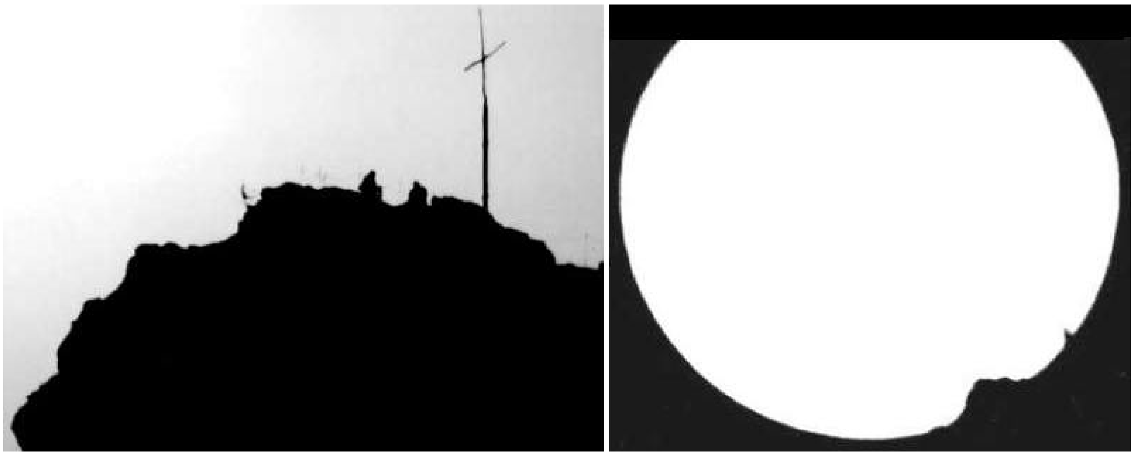
Figure 4: The profile of the stone when seen from St. Antonius and the sun´s occultation by the stone on June 21st 2000.

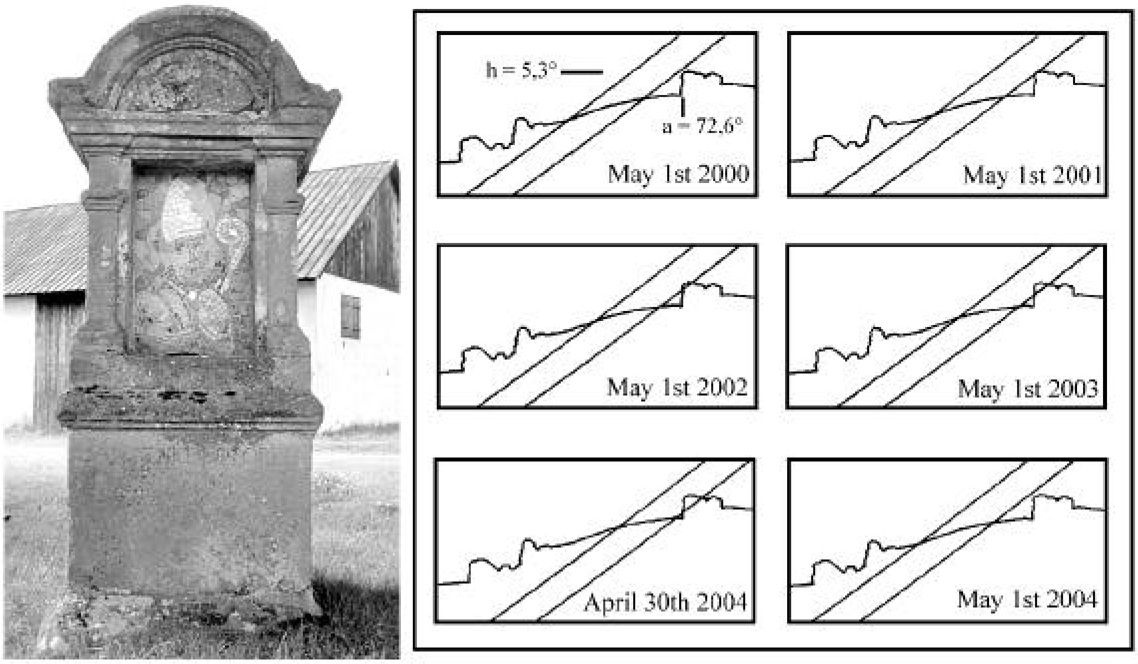

Figure 5: Calculated path of the sun on May 1st 2000 – 2004 including average refraction under normal conditions.

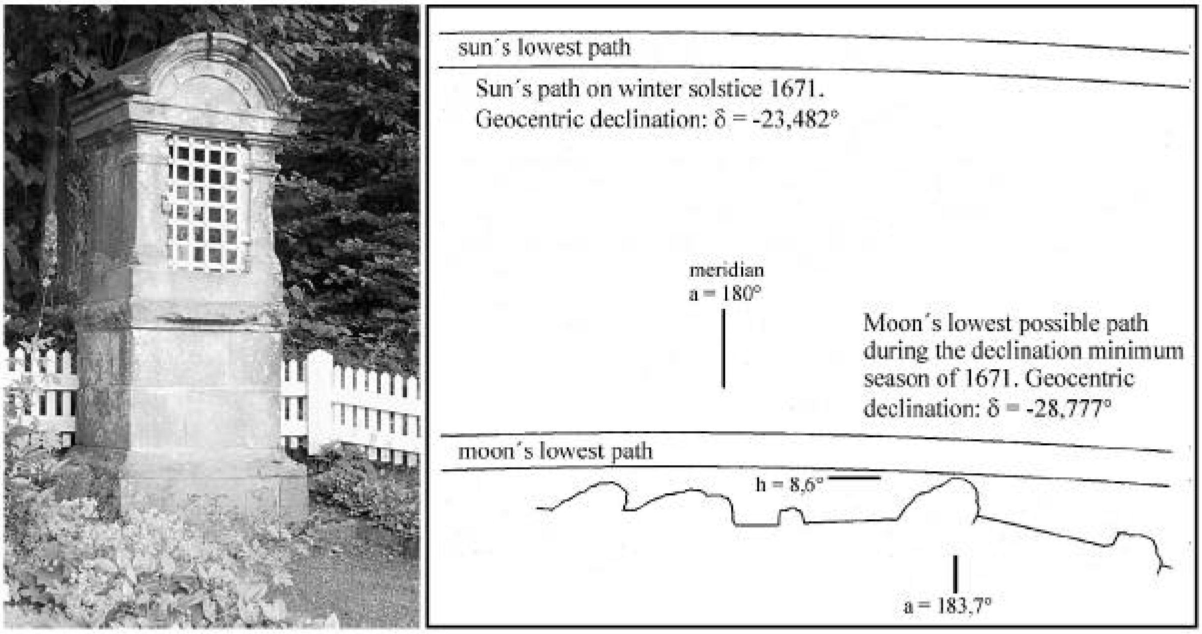

Figure 6: Calculated path of the moon in the absolute southern declination extreme including average lunar parallax and refraction.