

REMARKS ON THE ORIENTATION OF THE MEDIEVAL CHURCH AT KÁNA, HUNGARY

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ABSTRACT

An attempt was made to reconstruct the medieval method of orientation of the church of the monastery at *Kána* a former medieval (12th c.) settlement, now inside of Budapest. Copying the method presumably followed by the contemporary architect, we marked the axis of the ruins with poles, and attempted to sight the sun at a given day in such a manner as to bring it in line with the markers. We found that the polluted air covering Budapest prevented us from sighting the rising sun right on the horizon. The solar disc remained hidden by the layer until it reached an elevation of 2-3 degrees. Because of this instead of the direct sighting we were compelled to measure a sequence of the solar positions above the horizon and used extrapolation to determine the East point.

INTRODUCTION

One of the helpful supporting branches of European medieval scholarship is the study of the orientation of medieval churches. The basic rule was that the axis of the building (the nave) must be aligned with the East—West direction. The rules for the orientation of churches were codified in numerous writings of church fathers, or even issued as a papal bull. The following quotation from the writings of Bishop Gulielmus Durandus of Mende (13th c.) should serve as an example.

„Debet quoque (ecclesia) sic fundari, ut caput inspiciat versus Orientem... videlicet versus ortum solis, ad denotandum, quod ecclesia quae in terris militat, temperare se debet aequanimiter in prosperis, et in adversis; et non versus solstitialem, ut faciunt quidam.”

As the quotation shows, the ecclesiastical opinion was quite firmly in favour of equinoctial orientation, while solstitial orientation was rather frowned upon.

Since the last century, numerous investigations of this kind were performed resulting in a great many publications (e.g.: *Firneis, 1989; Guzsik, 1978; Kovács, 1964; Romano, 1992*). The data generated from the examination of the orientation of about one thousand churches show that the church rules about preferring the equinoctial orientation had not met with universal compliance. In fact the practice of solstitial orientation, against which Bishop Durandus warned, was also quite widely followed. In addition there are many examples of churches being aligned to the East—West direction prevailing on their patron-saint's name-day (*Guzsik, op. cit.*). These results show that the investigations performed with modern instruments were capable of yielding new historical information, so they were by no means superfluous.

In our investigation we tried to replicate the method the old ecclesiastical architects must have used, that is we have marked the axis of the church with two sticks, and we tried to see on which day the two sticks and the rising sun can be seen as a straight line.

THE CHURCH AND MONASTERY AT KÁNA

It can be safely said, that during the last centuries fate did not deal clemently with the buildings and monuments of Hungary or Eastern Europe. Many were destroyed outright, and even those which were left standing were often treated with less respect and care than would have been their due under better circumstances.

Kána, the former medieval settlement became by now part of the 11th district of Budapest situated at the edge of the gradually expanding capital. Unfortunately almost no vestiges remained from the settlement, and just the ruins remained from the monastery and the church (*Fig 1*). Excavations at the site started in 1981 led by Katalin Gyürky, researcher of the Archaeological Institute of the Hungarian Academy of Sciences (*Gyürky, 1989*).

The history of the monastery can be traced back to the 12th century. The feudal lord of the territory — according to archival evidence — held high office at the royal court as „*apud regem gratiosissimus*”. In the second half of the 12th century the usage became widespread in Hungary that wealthy feudal lords



Fig. 1. The view of the ruins (Photo by Mr. B. Tatai)

erected monasteries, supported them as seigneurs and used the monastic church as place of internment for themselves and their families. This way — presumably Benedictine — monks settled down in the village Kána and attached the building of their monastery to the southern wall of the very likely earlier existing small church.

The tradition is still alive among the local patriots of the district — although according to historians it has no foundation in reality — that the Bishop Saint Gherardo, who came as a missionary from Venice to Hungary, held his last mass here before his martyr's death.

THE MEASUREMENTS

We started our investigations in July, 1992 after discussing our aims with the archaeologist in charge. It became immediately apparent that the axis of the church pointed well to the South of any summer sunrise, indicating that our measurements should be carried out about the time of the equinoxes.

We made several attempts at measuring the direction of the sun at sunrise, but we had no success in sighting the sun at the moment of appearing on the horizon. At first we attributed this to meteorological conditions, but after we failed to see the rising sun even on clear days, we had to accept that, due to the air pollution, it is impossible to see the solar disc before it reached an elevation of several degrees.

This way it was made clear to us that the original medieval method of marking the church's axis with sticks and sighting the sun at the moment of its rising could not be reproduced, due to modern, urbanised atmospheric conditions.

After this realisation we had to modify our method. As it was impossible to establish the position of the rising sun directly, we decided on using an indirect method. After its appearance above the polluted layer of air, we took the sun's position several times in sequence. We plotted the vertical angular position against the horizontal position. The points were connected with a straight line, and the position of the sun at the moment of rising was determined by extrapolation from the intersection of the straight line and of the horizon. Taking into account the refraction the vertical angles have been corrected by 0.5 deg. (Marik, 1989). The orientation was determined as the angle difference between the intersection point and the axis of the church.

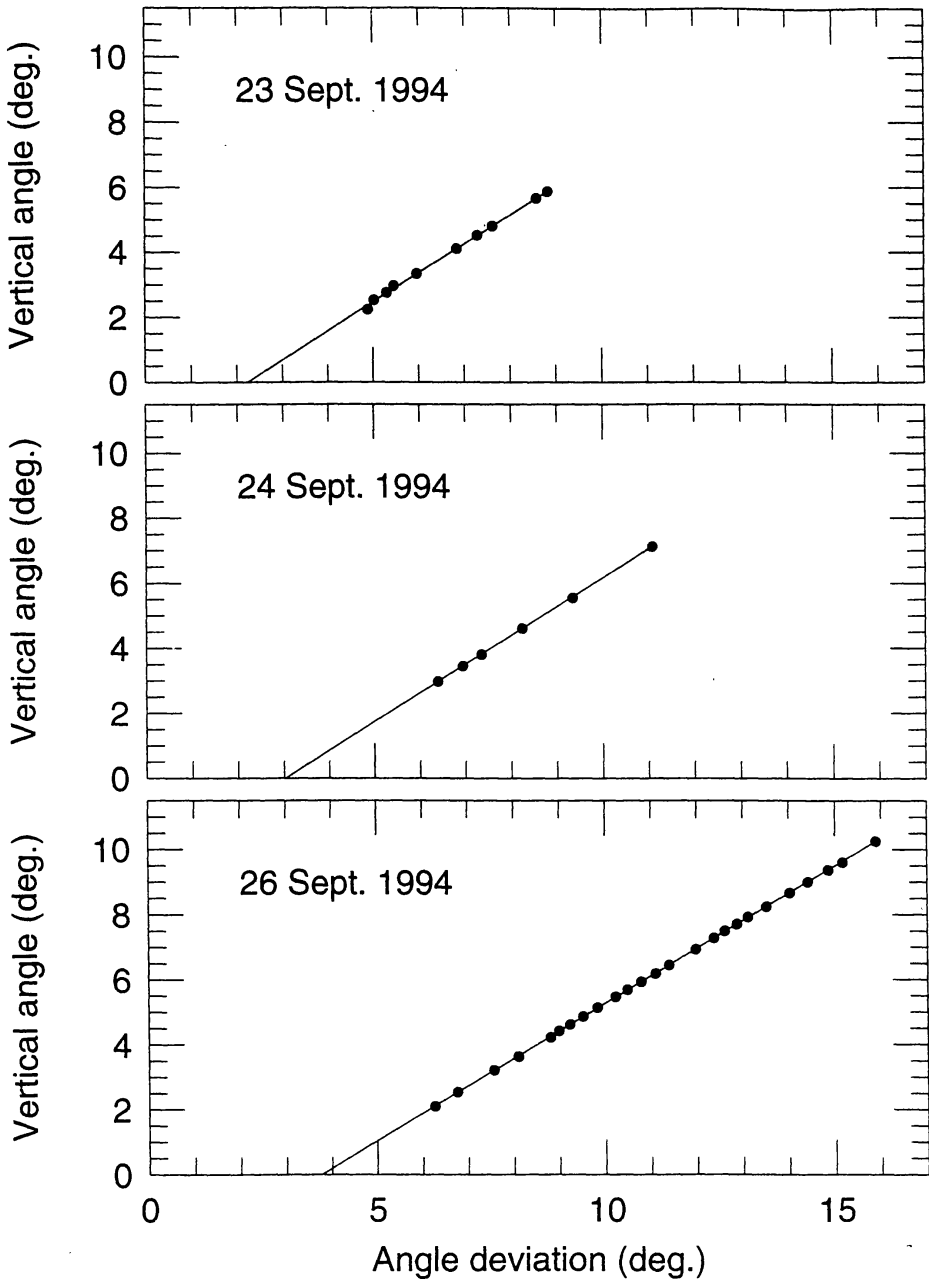


Fig. 2. The zero point on the horizontal axis is the direction of the church's nave. The intersection points show the direction of the actual sunrises.

The marking of the church's axis is the work of *T. Divéky* engineer surveyor. He also lent us the instrument used for the measurement. This instrument is capable of measuring horizontal and vertical angles with an accuracy of one angular second. It is more than we needed for our purpose, as it is extremely unlikely that the architects of the age could measure directions with an accuracy of better than 0.5 degree, that is one solar diameter. We tried to point the cross-hairs of the instrument at the centre of the sun's disk. Even though we used sunglasses as filter, with the rise of the sun above the pollution it became more and more difficult to take accurate readings. This presented a natural limit for the duration of our measurements.

The measurement	
Date	Duration
Sept. 23, 1994	21 min
Sept. 24, 1994	25 min
Sept. 26, 1994	50 min

Table 1.

We succeeded in getting quantitative results in days around the (vernal and autumnal) equinoxes in 1994 and in March of 1995. In all these days the weather was variable, cool and cloudy. On some occasions we had to wait for a glimpse of the sun through a chink in the clouds. The conditions for the measurements were most favourable in Sept. 1994. In *Table 1.* the time and the duration of these observations are listed. In *Fig. 2.* the results of these measurements are plotted.

On the 23rd Sept. we succeeded in making our observations practically at the time of the equinox. The measurements were carried out within half an hour after the sun's crossing the Celestial Equator. So the intersection of the sun's path with the local horizon belonging to this day can be considered as the East point. The deviations from this value on the consecutive two days demonstrate the sun's quick proceeding towards southern declinations. The data obtained at the vernal equinoxes in 1994 and 1995 do not contradict to this trend although they due to the weather, show less accuracy.

The angle deviation between the church's axis and the sunrise on the day of the equinox is 2 degrees (*Fig. 2.*) The church is 18 m long measured from its western wall to the apse. A deviation of 2 degrees from the centre of the nave (along the perimeter of a circle of 9 m radius) is about 30 cm, about the size of the block stones used in building the small church. *It does mean that the orientation of the small church can be considered equinoctial.*

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