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## CHURCHES ORIENTATIONS IN THE JESUITS MISSIONS AMONG GUARANI PEOPLE

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### ABSTRACT

The Jesuit order had an intense missionary activity in America during the colonial period. In particular, from the sixteenth century until their expulsion in 1767 they carried out an extensive and well-known work among the Guarani groups, in what became known as the Jesuit Province of Paraguay (now part of Argentina, Paraguay and Brazil). The large number of missions founded on this undertaking (30 survived the last period), were establishments with a well-studied urban plan one of whose axes was that of the church, which differs from both the urbanism proposed by the "Leyes de Indias" and the most classic ecclesiastical arrangements. This urban plan is of great importance for South American urbanism since it is an alternative paradigm to the order proposed by the colonial legal framework and constitutes a particular reinterpretation of the Baroque, which integrates contributions of the Guarani conceptions. Although Jesuit urbanism in the region has been studied, it has not been done within the framework of cultural astronomy.

In general, the works of cultural astronomy dedicated to the orientations of churches have divided these studies by chronological periods, and by geographical areas. We believe that adding focused approaches to specific religious orders can be very fruitful given the variety of methodologies and intentions. With this idea we undertook a joint study of the orientations of the Jesuit missions of the Guaraní region. During the fieldwork the sites of the 30 missionary villages in question were visited in Argentina, Brazil and Paraguay. We have measured the twenty-one existing ruins and analyzed the old planes of the nine of which there are no recognizable material remains.

The work deals with the results of this survey by putting in to dialogue with existing studies on Jesuit urbanism and with the chronicles and writings of the Jesuits themselves. We seek to establish the relevance of astronomical observation for the ordering of these missions and their interaction with other criteria.

One of the first results shows that the orientation axes of the churches of these missions do not follow the arrangement expected in general in Christian churches, associated to the solar range. We discuss what the orientations found can tell us about the methods used to bring them to practice and relate these evidences to the testimonies of the Jesuits themselves.

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**KEYWORDS:** Christian churches, Jesuit churches, orientation of churches

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## INTRODUCTION

The study of orientations of Christian churches is one of most traditional fields in cultural astronomy (González García 2015). It should be placed in the context of a broad analysis of the relation between astronomy and Christianity (McCluskey 2014a). Great efforts have been made in the last twenty years in the study of church orientations, well synthesized in recent works (González García 2015, McCluskey 2014b). Two major types of guidelines have been the most reported by these researches. The first of these is the one mentioned in many early sources. These sources indicate that it is necessary to orient the church in a way that the priest -during the prayer-faces to the point of equinox sunrise, with the ambiguities that this implies (González García 2015: 268-269). The second group of orientations refers to the sunrise on the day of the patron saint, the day of a certain festival or the start of the construction (González García 2015: 268-269, Liritzis & Vassiliou, 2006 a, b).

Several works have addressed the relevance of pre-Christian substratum or coexistence with non-Christian communities. This has involved in some cases the search for differentiation (González García & Belmonte 2014) and in others the use and reinterpretation of patterns of these other traditions (García Quintela et al., 2015).

In the case of the American continent, work has been done especially in Mexico (Zimbrón Romero & Moyano 2015), and in the Andean region (Moyano 2011). In many of these researches, emphasis has been placed on how the Christian tradition re-appropriated local traditions of orientation.

In the investigations carried out in the past decades, in general, samples associated with the same geographic region have been selected, or with the same time cut, or both factors simultaneously. In this way they have sought to construct statistically homogeneous and culturally significant samples. Far less frequent has been the study of the constructions of a specific religious order in a given period - an example is the study of churches of the Cistercian Order in Italy (Incerti 2001). We believe that this is a very interesting approach since in the Christian tradition the orders have frequently had an important degree of autonomy and their own constructive, symbolic and political programs. A case in which this is particularly true is that of the Jesuit Order in

South America in the 17th and 18th centuries. That is why we have considered a study focused on the churches built by the Jesuits in their most famous missions in the continent, the ones on the Jesuit Province of Paracuaria, from their foundation -1609- to the expulsion of the Jesuit Order -1767-.

## THE JESUIT ORDER

The Society of Jesus (*Societas Jesu* also known as "The Company") was a catholic religious order, founded in 1534 by Saint Ignatius of Loyola. Saint Ignatius was a Basque nobleman with a military background. He organized the order in an analogous way to an army. The Company depended directly from the Pope and had a crucial role during the Counter Reformation. It had priests and lay members. Conducted by the *Prepósito General* and a council: The General Congregation. The main task of The Company was the evangelization. As part of their mission they worked on education and intellectual research. For this reason, many Jesuits had a good intellectual formation, and the order itself had a good educational program for their members. But, in practice, the Jesuits had a broad spectrum of degrees of astronomical knowledge. The autonomy and power of the order conducted to conflicts with the Portugal and Spanish monarchies. These conflicts produced the suppression of the order in 1767. The order was restored in 1814.

The main missions, among non-Christian people, of the Jesuits Order during the period 1534-1773 were those of China and those of the Province of Paracuaria (founded in 1604), in South America. The Jesuit Province of Paracuaria involved, at the moment of their foundation, the south of the present Paraguay, a north east portion of Argentina, Uruguay, part of Bolivia, part of Chile and part of the south of Brazil. The city of Córdoba, in the present Argentina, was the place of residence of the Provincial Father, the Province's authority. The main missions of Paracuaria Province were the thirty "Pueblos" of Guarani Indians (Figure 1).

It is said (Sustersic 2010: 31) that Jesuits sent astronomers to China and mystics and artists to Paracuaria. In spite of this, the missions of Paracuaria gave notable astronomers (as for example Buenaventura Suarez, Frías and Quiroga).

## JESUITS MISSIONS AMONG GUARANI PEOPLE

The missions among the Guaranies became a model for Catholic missionary activity. Several factors contributed to this. On the one hand, the Jesuits tried to keep the Guaranis separated from the Creole population and founded their missions as independent villages of the colonial foundations. On the other hand, the Jesuits studied the Guaranis language and traditions and tried to Christianize them by re-signifying many of their practices and beliefs. Third, the social life of the Guaranis missions was strongly

organized by the Jesuits and aimed at constituting a kind of "ideal society", an utopia of what a Christian society should be. Fourth, they instructed the Guaranis in European artistic disciplines, particularly music, painting and sculpture. Finally, the cultivation of *yerba mate* (*Ilex paraguariensis*) on a large scale, the formation of a solidarity network of missions and the local production of numerous manufactures provided them with important economic autonomy and, therefore, independence from the civil power.

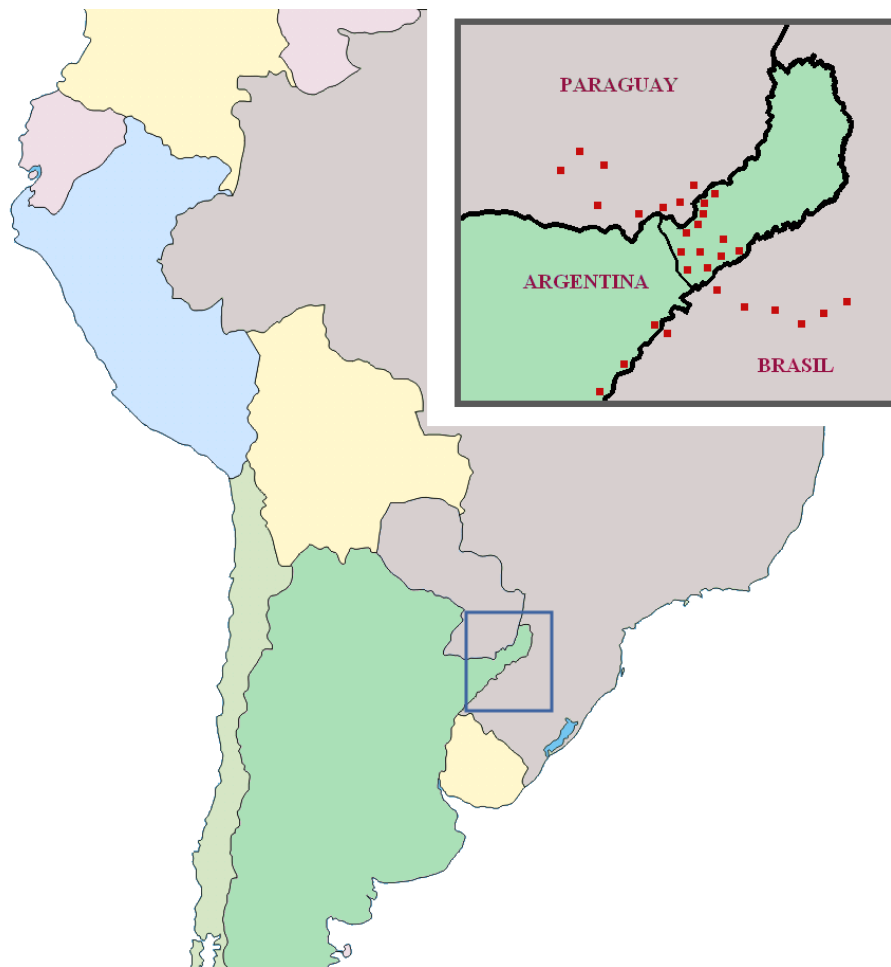


Figure 1: Missions of Paracuaria Province

## ORIENTING MISSIONS

In keeping with the planned and religious-centered nature of the Guaranis missions, its layout was not left to chance (Figure 2). The typology of the same ones was different from the proposed for the colonial cities by the Laws of the Indies or the Baroque urbanism. Despite the influence of European utopian models, the peculiarities of the Guaranis inhabit design were important (Sustersic 2010: 417-418). The construction of the missions can be divided in three major periods:

\*Foundational (1609-1632): There were 48 villages in this period. The typology frame was the urbanistic instructions of Diego de Torres: follow the colonial "checkerboard" or the Indians' traditions. The missionaries mixed the colonial Spanish "chekerboard" and the Guaranis Tekoha with only one ceremonial center (Sustersic 2010: 166). The churches construction followed wood constructive techniques from Guaranis people with Jesuit reinterpretations.

\*Typical (1632-1690): 30 towns were founded during this period and 141.000 Guaranies lived there at that time. The characteristics of this period are the

most typical of the Jesuits guarani mission's architecture.

\*Baroque (1690-1767): In this period it is important the influence of the Italian Jesuits: Danesi, Prímoli, Brasanelli and Sepp -great renovators of the urban plan but based on the pre-existing tradition (Suster-sic 2010: 166)-.

These three periods have their impact in many missions, because we must remember that most of them were moved 2 or 3 times.

The general structure of a mission follows a very constant pattern.

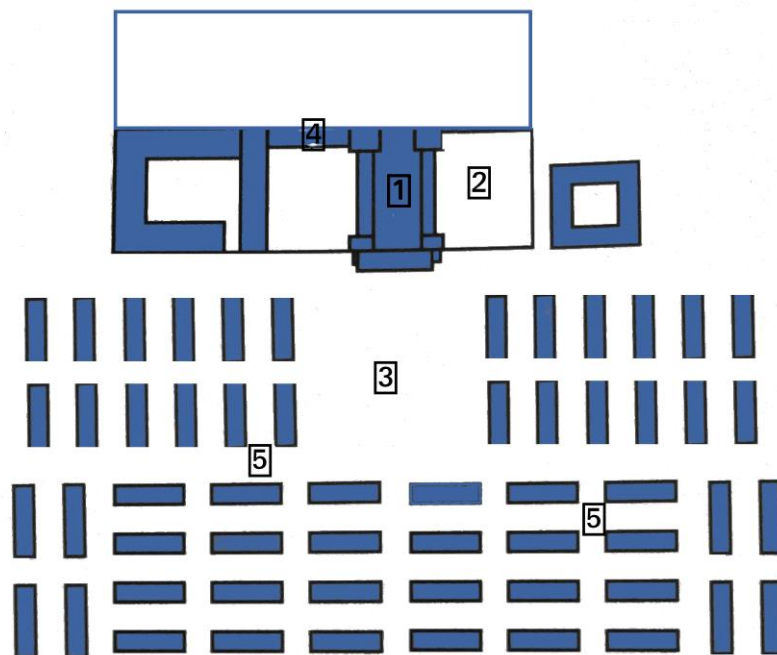


Figure 2: The general structure of a mission. 1) Church, 2) Cemetery, 3) Main square, 4) Missionaries' houses, 5) Indians' houses

Most of the missions were explicitly build in the highest ground in its surroundings, and with plain horizons (Sepp 2009: 76). The region has not prominent horizon marcs. The missions were immersed in a general jungle landscape.

From testimonies such as those of Fathers Sepp (2009: 200-201) and Cardiel (Busaniche 1955: 51-53) it is clear that the general outline of a mission was based on the orientation of the church and the square. In addition, the churches were built by placing two rows of wooden posts that supported the gabled roof of the nave. In other words, the longitudinal axis of the church was the key to the entire urban layout.

## DATA COLLECTION

We can currently find twenty-one ruins of the thirty missions that existed in this area at the time of the expulsion of the Jesuits, eight in Paraguay, seven

in Brazil and fifteen in Argentina. The results of the orientations of these churches can be found in the orientation diagram of Figure 3. We have obtained the orientation of 6 other churches (Apostles, San Javier, Martyrs and Corpus Christi in Argentina, San Ignacio Guazú in Paraguay and Sao Borja in Brazil) from ancient plans (Maeder 1994). Of the remaining three (Santo Tomé, in Argentina, Santa María de Fe, in Paraguay and Sao Luis in Brazil), we could not find data. All the missions were established in high parts of practically flat areas; therefore, the horizon heights do not exceed one degree. Currently the average magnetic declination in the area is about 14° NW.

We have found that a single ruin presents the canonical orientation proposed by the Fathers of the Church (Concepción, Argentina), that is, the apse of the church is within the solar arc towards the eastern part of the horizon.

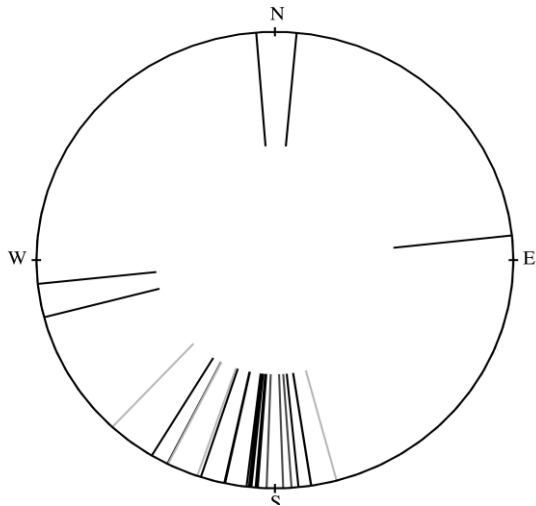


Figure 3: Orientation diagram of the Jesuit churches

The rest of the orientations coincide roughly with what the literature on these missions indicates. These texts speak in an imprecise way of an orientation "towards the South" of the apse of the churches of the missions.

But nonetheless this general coincidence, there is a significant dispersion.

Also it is interesting to note that the first Jesuit Church in Cordoba, Argentina (built around 1650) has the canonical orientation and the church of San Ignacio de Loyola in Buenos Aires, (1675) is oriented with the apse to the west.

## DISCUSSION AND CONCLUSION

We see that most of the churches that we have studied are oriented towards the south (although with an important dispersion). Given this pattern, we must try to answer two big questions: how did they orientate them? And why did they orientate them like this?

In reference to the second question, there are few indications in documents or previous studies about the possible reasons. Father Sepp repeatedly mentions that he sought to align the square and the streets of the San Juan mission with the cardinal points (Sepp 2009: 200-201). Father Cardiel (Furlong 1953: 154) points out that the orientation of the church leaves the door on the N-S axis so that sunlight cannot enter much through it neither in the morning nor in the afternoon. According to him, this prevents the church's interior from overheating and indicates that orienting the church with the door on the E-O axis is typical of mild weather regions. Sepp points out that the church was illuminated by the front door (Sepp 2009: 202-203).

Regarding how they were oriented, it is important to remember the absence of prominent features of the landscape in the region. The only previous work that

advances a hypothesis (Queirel 1901: 31) ventures the idea that the Jesuits used the compass to guide the missions. It is not impossible, since several testimonies indicate the existence of compasses among the Jesuits. But the testimonies also point to doubts about their behavior in the southern hemisphere by the Jesuit intellectuals (Sepp 2009: 34-35). Queirel bases its conclusion on the fact that it finds a consistent orientation in San Ignacio Mini in Argentina, and that this is not the geographic north-south axis nor the magnetic north-south axis of his time -he performed his measures in 1899 and he indicates that at that time the magnetic declination was of  $3^{\circ} 20'$ . For this reason he assigns the difference between the geographic north and the axis of the church to the magnetic declination for the Jesuit period, fixing its value at  $8^{\circ} 28'$ . But that does not seem to be the situation. The IGRF model of the NOAA calculator (<https://www.ngdc.noaa.gov/geomag-web/>) throws for 1696 -foundation date of the ruins studied by the author-  $12^{\circ} 93'$  east of the north, very far from the  $8^{\circ} 28'$  of Queirel. The same model yields values of magnetic declination for 1784, similar to those measured at that time by Felix de Azara (1943). Azara gives us the declination for San Ignacio Guazú:  $12^{\circ} 07'$  and for Santa Rosa de Lima:  $12^{\circ} 10'$ . The calculated values are:  $11^{\circ} 51'$  and  $11^{\circ} 50'$  respectively.

Stellar indicators could have been used. Sepp mentions that the Southern Cross can fulfill in the southern hemisphere the role of the polar star in the north (Sepp 2009: 37). But there are no concrete indications of how they would have implemented a possible stellar orientation method for the axis of the churches.

The observation of solar movement in missions and the use and construction of sundials is abundantly attested (Sepp 2009: 35, 236). In fact, we can currently find a sundial in the mission of San Cosme and San Damian, in Paraguay and another in La Cruz, in Argentina. But if a gnomon had been used to determine the E-O line and its perpendicular N-S, the scattering of orientations that show the data should not be found. The same would have happened if the sunrise and sunset positions at the same day had been used.

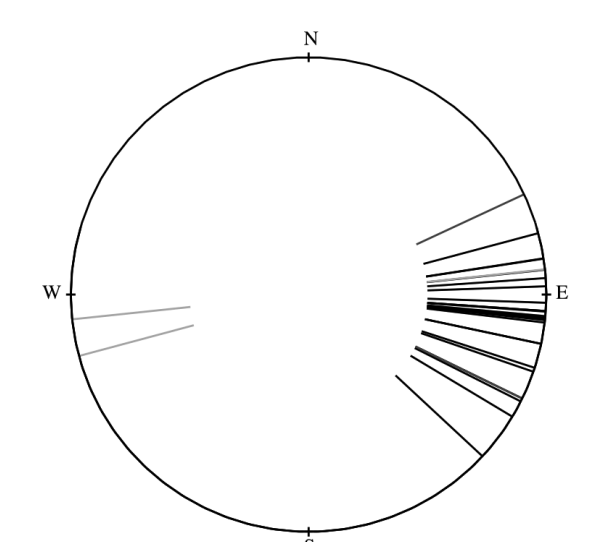


Figure 4: Diagram of the perpendicular lines to the orientations measurements

We have considered a last possibility that allows us to simultaneously explain the homogeneity and dispersion of the sample. It is about using only the sunrise or only the sunset on the day when each mission was planted in the ground. This would result in a different orientation for each mission, whose perpendicular would be used to trace the longitudinal axis of the church in each case. To evaluate this hypothesis, we have considered the directions perpen-

dicular to the obtained measurements and we can observe that the great majority are in the solar range, as predicted by the hypothesis. Figure 4.

In fact, in two (Santa Rosa de Lima in Paraguay and Corpus Christi in Argentina) of the three missions for which the date of the final settlement is known (Santa Rosa de Lima, in Paraguay, Corpus Christi and San Ignacio Mini in Argentina), the perpendicular to the direction of sunrise for those dates agrees reasonably with the orientation of their churches.

We believe that the proposed hypothesis is compatible with the data obtained and with what the Jesuit sources informed us. Sepp's description of the beginning of the founding works of San Juan mission and the beginning before dawn of the working day of the missions suggests that the dawn could be the moment chosen to determine the orientation of the mission.

We hope, in the near future, to conduct similar studies in Jesuit missions from nearby regions, in order to analyze similarities and differences. In the same way we hope to continue the archive work to find more evidence of the techniques used and the senses attributed to the orientation of the missions.

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