

MENSURA CAELI

Territory, Town, Architectures, Tools

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Abstract. A brief discussion is given on the possible contributions of the schools of architecture to the safeguard of important monuments of astronomical interest. Some highlights of a meeting dedicated to the Italian astronomical cultural heritage are also reported.

Keywords. Cultural astronomy, archaeoastronomy, architecture

1. Introduction

The sky, our common and universal heritage, is an integral part of the environment perceived by mankind. The astronomical cultural heritage is the demonstration of the complexity and diversity of modalities through which various civilizations have rationalized the universe and adapted their actions in compliance with their understanding of it. Astronomical phenomena were observed since the very beginning of the prehistory of man, and the various attempts at interpreting these phenomena have contributed strongly to the development of human knowledge. Material evidence related to astronomy can be found all over the world, and covers all ages, from prehistory up to the present day; see e.g. the UNESCO thematic initiative *TI Astronomy and world heritage, 2004*.

Among the *measurements* involved in the conception, definition and implementation of artefacts, it is worth recalling not only length and area but also *measurements from the sky*, that is to say, the understanding and interpretation of celestial space and its interaction with mankind through the geometrical laws of its motion.

The understanding of the development of the astronomical knowledge through its material expressions depends widely on combined research between the various disciplines of physical and human sciences. It should be remarked that it is only from an analysis and study of the various characteristics - archaeological, archaeoastronomical, architectural, ethnological, and geographical - of the (archaeological and non-archaeological) architectural and urban sites connected to astronomy, that it is possible to get a global picture of the variety of information, so that new and original models can be proposed for its interpretation. As it is well-known, at present the most advanced international programme was set up by UNESCO (World Heritage Centre), which recently instituted a new thematic initiative, *ASTRONOMY AND WORLD HERITAGE* (see the *Extract of the Decisions adopted by the 29th session of the World Heritage Committee, July 2005*). The central element of the UNESCO project, which aims to identify, safeguard and promote astronomically interesting sites and cultural heritage, is the necessity of elaborating the mainstreams of research related to different disciplines of historical and physical sciences which converge on this purpose. One of the main targets of the project

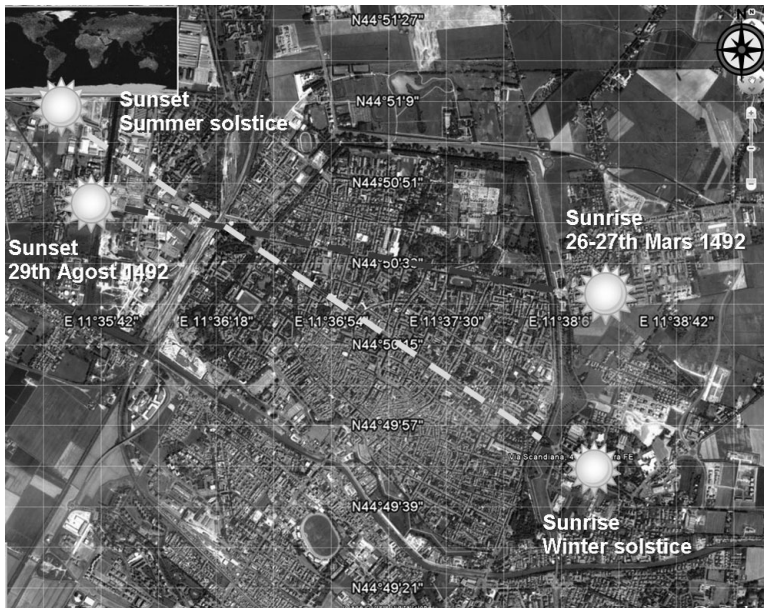


Figure 1. *The twelfth part of the sky: from Schifanoia Palace to the Ferrariae Novae Restauratio*, by M. Incerti. The study confirms the importance of the calculation of the horoscope of duke Borso d'Este for the Schifanoia Palace, and the horoscope of the foundation (see Fig. 2) for the “Ferrariae Novae Restauratio” (15th century). The figure shows the plan of the town of Ferrara with the main astronomical directions.

is to meet the need for the availability of the whole data set: this is not only directed to the enlargement of the present knowledge, but also to the better preservation and exploitation of the historical/archaeological sites and heritages connected with astronomy. The Point II of the classification proposed by the Thematic Initiative, Architectural Sites and Urban sites constructed according to astronomical perspectives, includes: i) temples which served for the glorification of deities associated with planets (and/or other outer space objects); ii) historical cities; iii) architectural monuments.

The contribution of the Schools of Architecture is considered today with attention, because at present the number of the architectonic (not archaeological) studies of monuments is still limited. Very important are:

- the multiplicity of potentialities, which range from the procedural and methodological issues to the knowledge in some specialistic areas of the history of geometry, to the modelling in studying and checking hypotheses of research;
- the use of integrated information system (IS) for the knowledge, safeguard and management of the heritage of importance for astronomy.

2. Mensura Caeli

The 8th Conference of SIA (Società Italiana di Archeoastronomia), *MENSURA CAELI. Territory, Town, Architectures, Tools*, was dedicated to these goals, in preparation for the opening of the IYA2009 (see <http://www.brera.inaf.it/archeo/index.htm>). The meeting was centered on the works of man based on the measurements of the sky. The subject included therefore the territory and the foundation of towns, the architecture and the tools. The sessions were dedicated to:

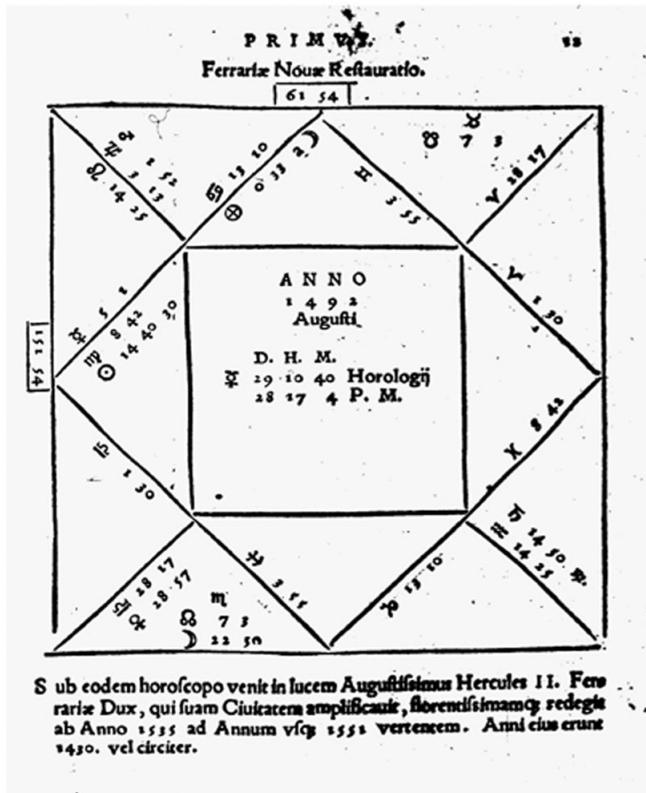


Figure 2. “Ferrariae Novae Restauratio” (Fig. 1): the horoscope of the foundation (Luca Gaurico 1552, for the day August 29th, 1492 Julian Calendar).

- *Archaeoastronomical Surveys*: methods, procedures and results; use of digital representation and IT systems for the knowledge, preservation and management of cultural heritage of astronomical interest.

- *Cultural Astronomy*: reconstruction of astronomical, geometrical and instrumentation knowledge of makers, designers and sponsors, from antiquity to the eighteenth century; reconstruction of astronomical events using historical data from the pre-telescopic epoch; impact of astronomical knowledge on social life, with emphasis on artistic/cultural fields; problems of preservation, valorisation and safeguards.

The Conference was the last of a series dedicated to cultural astronomy and archaeoastronomy. The series started in the nineties with the meetings at the Accademia dei Lincei (e.g. Accademia, 2001), and several proceedings were published (e.g. Antonello, 2008) along with the *Rivista Italiana di Archeoastronomia*.

The meeting was organized by the *Center Astronomy and Cultural Heritage - ACHe* of the University of Ferrara, on October 17-18, 2008; the purpose of the *Center* is to build a link between the physical and human sciences, with the research target of identifying the scientific and cultural values of the cultural heritage related to astronomy. The opening talk of the meeting was given by A. Sidorenko-Dulom, Coordinator Thematic Initiative “Astronomy and World Heritage”, UNESCO World Heritage Centre, and the main points were: why “Astronomy” and “World Heritage”, implementation strategy, database, nomination of properties to the World Heritage List. In the following we will mention few other talks, while the examples shown in the Figures from 1 to 7

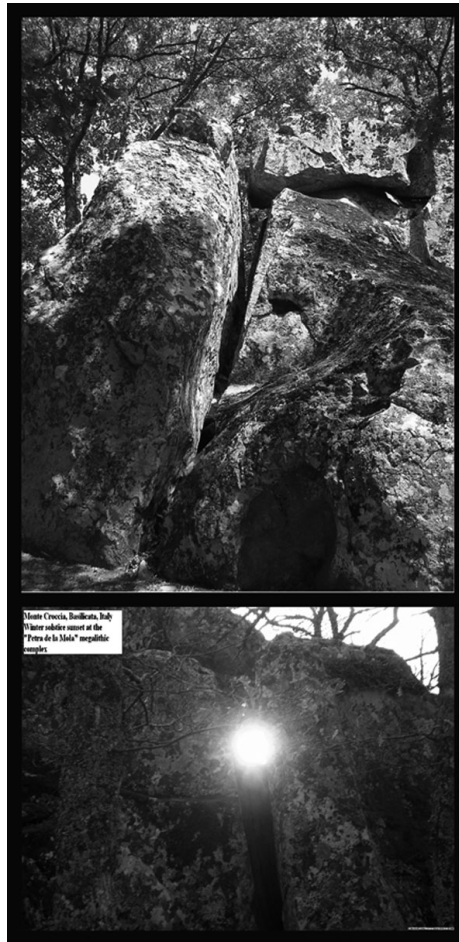


Figure 3. *Monte Crocchia: the megaliths (III - II millennia B.C.),* by V.F. Polcaro (INAF-IASF, Rome). Sunset winter solstice of the megalithic structures of late Neolithic - Early Bronze Age. There are some similarities with the megaliths of Petra 'ru Mulacchio located in a nearby region, showing the possible existence of a common ancient culture in this part of Italy.

illustrate some of the topics discussed at the meeting. S. Rizzo, coordinator of the working group “Cultura Immateriale e Diversità” (Nonmaterial culture and diversity), presented a program for the safeguard and promotion of the expression of cultural diversity, which included also the astronomical cultural heritage. E. Mandelli, of the Architecture Faculty of Florence, discussed the link between the culture of building and the astronomical culture, while G. Cataldi presented the theory of the Forma Quadrata, that is the possible procedures of the roman land surveying, “Secundum caelum, Secundum naturam”. G. Magli, of the Faculty of Civil Architecture of Politecnico of Milan, discussed the issue of the meaning and function of the town of Macchu Picchu in Peru, by taking into account the astronomical and symbolic references in Inca architecture and town planning. Finally, an interesting modern approach to the application of astronomy to art and architecture was discussed by A. De Rosa who presented the work of J. Turrel.

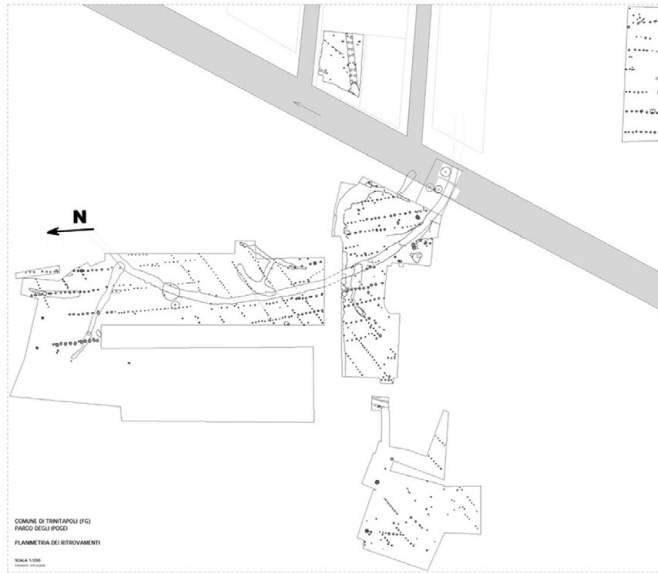


Figure 4. The “Madonna di Loreto” site in Trinitapoli (Apulia), by A. Tunzi & M. LoZupone (Soprint. Archeol. Taranto), E. Antonello, V.F. Polcaro (INAF), & F. Ruggieri (UAN, Napoli). The plot shows the plan of the largest sanctuary of Bronze Age known to date in Italy. An impressive complex of hypogeal sacred structures and long rows of holes are excavated in the crumbly local calcareous subsoil. At the present stage of the research we can assume that the hole alignments represent probably a giant stone calendar. The holes were made during several centuries according to a specific project which took into account the positions of some celestial bodies.

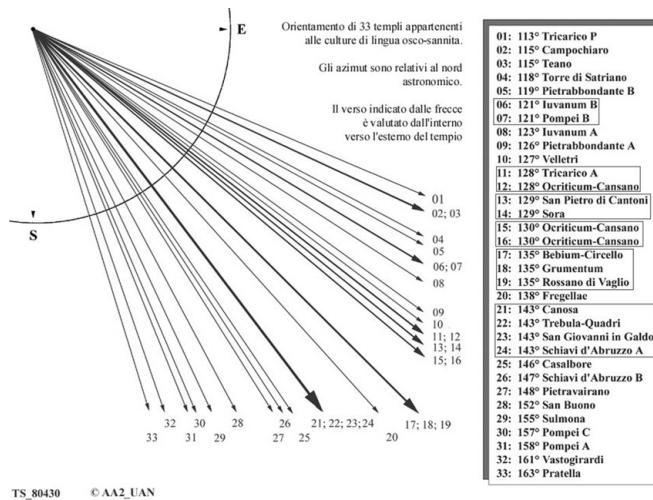


Figure 5. The analysis of temple orientations of Italics populations, by M. Pagano (Soprint. BB.AA., Caserta-Benevento) & F. Ruggieri (UAN, Napoli). This work is the last step of a long term survey involving the measurement of the azimuth of almost all the temples and sacred areas belonging to populations speaking oscan language and living in central and southern Italy, between the sixth and the first century B.C. The analysis of the azimuths proved that most of the temples have orientations in a range of 51 deg between East and South directions. It is known instead that Roman temple orientations have a much larger range, only the North direction being excluded. Therefore the different results of oscan and samnite temples show that such Italics populations preferred specific orientations.



Figure 6. *Roccabruna: an adrianean architecture as an image of the sky*, by G.E. Cinque & E. Lazzeri (University of Rome Tor Vergata). The fascinating architecture of Roccabruna should demonstrate the strong passion of the emperor Adrian for the astral studies. The building could be a site dedicated to such studies and at the same time a commemorative architecture of celestial beauties. The virtual image shows a reconstruction of the central room of the building, where the structure of an armillary sphere was positioned by means of ropes in such a way to appear suspended in the vacuum below the dome, whose decoration probably reproduced a starry sky.

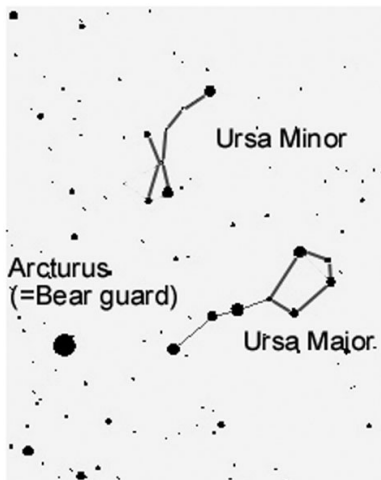


Figure 7. *Arcturus and the Bears*, by E. Antonello. Among the ancient myths handed down by Greeks and described in detail by Ovid, that of the nymph Callisto transformed into a she-bear and of his son Arcas (the hunter) deals with the origin of Ursa Maior and the nearby constellations. Taking into account the change of the constellation shapes due to the stellar proper motions (and including radial velocities and distances), it would be possible to interpret the constellations of about fifty thousand years ago, shown in the plot, as the opposition of a hunter (Ursa Minor) and a standing bear (Ursa Major).

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