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## **Archaeology and Technologies – Applied Research**

## The fortified medieval settlement of Rocca Montis Dragonis (Mondragone, Caserta – Italy) virtually alive.

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**Abstract:** The fortified settlement of Rocca Montis Dragonis (Caserta-Italy) is located on the top of Mount Petrino, between the river Liri-Garigliano to the north, and the river Volturno to the south. From 2001 until now, archaeological investigations discovered a big part of the entire settlement, known on written sources from 12th century, which is a big size hilltop site, characterized by a complex group of structures hierarchically distributed in three different areas.

The main focus of this work is to produce friendly communication tools, aimed to develop storytelling, by Virtual Reality methods, concerning the results of recent archaeological excavations, and in particular those aspects from which generates the phenomenon of “incastellamento”. The methodology used in this research runs from detailed observations of the artefacts evidence and from the study of low scale settlement dynamics, to the general interpretations concerning the architecture of the *Rocca Montis Dragonis* and the social and economic aspects referred to the building opera. On what concerns these aspects we could define this method an “inductive” one, from which originates every scientific result.

The main targets of this paper have been the use of the huge archive deriving from the archaeological activities, interesting one of the most important medieval castle of northern Campania (Italy), to reconstruct with new technologies the original shape and the life of this settlement. Moreover the application of 3D virtual technology is aimed to the best promotion, knowledge, protection and conservation of this particular item of cultural medieval heritage.

**Key-words:** 3D virtual reality; medieval castles; medieval archaeology; cultural heritage promotion; ITC for cultural heritage.

### An introduction on archaeological data.

The fortified settlement of *Rocca Montis Dragonis* (Caserta) is located on the top of Mount Petrino, in the middle of an area adjoining to northwest the plain of Sessa that extends to the Liri-Garigliano rivers, delimited by the towns of Traetto, Formia and Gaeta, to east the slopes of Mount Massico, to south the fertile flat land of the “Campania Felix”, crossed by the river Volturno and extended until the volcano Vesuvius and to west the sea (Fig. 1).



Fig. 1 – a) Map of the Mondragone territory (from *Grande Atlante Geografico d'Europa e d'Italia*, Novara 1995, tav. 28); b) Map of Mondragone and Mount Petrino (IGM 1:25.000)

The orography of the site is marked by a bare southern slope characterized by rocky outcrops and by a north-west side that faces the narrow coastal strip; the north side is formed by a saddle ending with a slight plateau, behind closed from Mount Massico which represents the unique side to ascend the fortified site; at the end the eastern slope is a very narrow ridge, sloping towards the plain that separates the Mount Petrino from Mount Massico (CRIMACO and SOGLIANI 2002, 2007, 2009)

The fortress, known on written sources in the early XIIth century, is a big size hilltop site, characterized by a group of interior spaces and structures rather complex and hierarchically distributed in three different groups (Fig. 2).

All the buildings built on the rocky spur of the hilltop plateau of Mount Petrino, enclosed by a first curtain wall, bounded on the west by a massive semicircular tower, are overlooking the entire settlement. The whole area represents the original fortified settlement, keeping for a long time the dual role of defensive bulwark for soldiers and refuge for civilians.

The western part of the plateau is occupied by a large building, built in a later phase in respect of the original plan of the plateau, which has changed the course of the first walls, emphasizing the role of hierarchical prominence of the top of the settlement.



Fig. 2 – The Mount Petrino with the fortress on the top, view from the northern slope.

On the eastern side of the plateau, a first fortified village develops, with a pentagonal tower to the west; the village is characterized by a small religious building, some large buildings with multiple rooms and by a well-organized rainwater supply system, set up by a series of small tanks joined together. Finally, on the south side, a second village develops, with a lot of two, three and four rooms houses ranged along roads following the curves level. A third curtain wall protects the east and the west side of this village, thanks to two straight separated walls, oriented north-south. More defensive structures are located along the ridge down to the sea: a long and large “antemurale”, reinforced by two big towers, was to defend the northern side of the mountain, which is the entrance to the fortified settlement (Fig. 3).

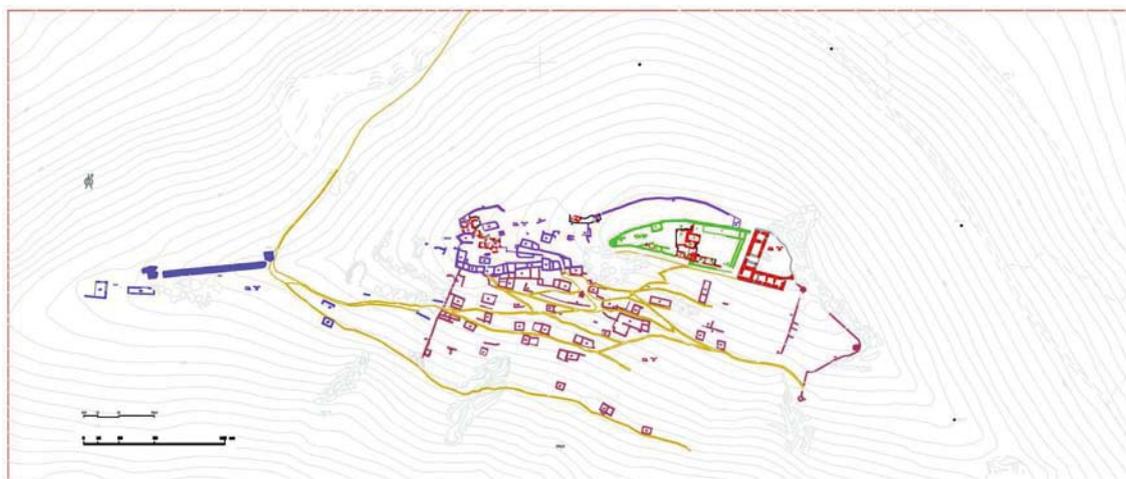


Fig. 3 – The plan of the fortified settlement of *Rocca Montis Dragonis* (M. Cerovaz).

The excavated areas in the first nine archaeological excavation campaigns (2001-2009) are included within the Architectural Complex "B" (hilltop plateau) and within the Architectural Complex "C" (first fortified village), where several buildings have been investigated (SOGLIANI 2009b). The geographical location of the fortified settlement has emphasized, from the first phase of use, recently dated to early middle age, the strategic role of territorial control and defence. Compared to evidences dated to Norman period, the Swabian one is more clear in respect of archaeological and documentary data; under Frederic the Second the Rocca was included between the *Castra exempta*, under his direct control and administration (Fig. 4).



Fig. 4 – a) The coastal line at the west side of the fortress; b) the northern flatland from the hilltop of the fortified settlement.

Later on, under the policy of castles, towns, counties and properties donations, committed by Charles I of Anjou on behalf of those who had supported the conquest of the Kingdom, in 1269 the fortress of *Rocca Montis Dragonis*, was awarded to Philip, King of Thessaly for its strategic military value, and throughout the Angevin kingdom, his possession returned to the policy of radical renewal of feudality, which included the appointment of France and Provence holders to the highest secular and ecclesiastical dignitaries. In the mid-fifteenth century, during the conflict between Angevins and Aragonese for the conquest of the kingdom, the *Rocca*, which was at that time one of the most important strongholds of the Duchy of Sessa, is besieged by the troops of King Ferdinand I of Aragon, and subsequently in 1461 was granted to the Carafa family. In the current state of investigations, it is possible to recognize an important restoring phase that involved the buildings of the hilltop plateau during the XIVth and XVth century, characterized by a radical reuse of architectural structures and by the new featuring of the fortifications, with the construction of the large building, known as the "residential palace" (SOGLIANI 2009a) (Fig. 5).



Fig. 5 – The “residential palace” on the east side of the hilltop plateau of the fortress.

Important finds are the potteries and the numismatic evidence, and the metal and vitreous artefacts discovered in the excavation areas; imported ceramic productions, as enamelled polychrome vessels, gave evidences of significant economic exchanges between the fortified settlement and the sites of central Italy (Fig. 6).



Fig. 6 – a) Lustre bowl; b) polychrome enamelled cup from Deruta; c) green and brown enamelled cup; d) polychrome enamelled jug (from southern Latium); e) polychrome enamelled cup.

All the buildings investigated up to now on the hilltop plateau and in the first village, were probably in use until the XVIth century, when the collapse of the roofs obliterates them, being the cause of the desertion of the entire settlement.

### The Castle virtually alive

The system of the Petrino Mountain, on which the medieval fortress is situated and of the ancient street Appia constitutes a sort of container of the human history thanks to the presence of numerous archaeological sites dated from the prehistory to the Renaissance and modern age. The topographical investigations (surveys) conducted in the last years in this area have produced a big repository of all the archaeological sites, and so it is possible to reconstruct, through the landscape archaeology, the settlement systems in the various historical (from the prehistory to the modern age) periods and the approach of the communities to the various available resources. In such sense the medieval village of *Rocca Montis Dragonis* with its castle is becoming a point of reference, to European level, to rewrite the history of the medieval settlement and the history of the specialized agricultural crops among which the grapevine and the wine. The archaeological research is now focusing the attention to such rich territorial resource, reflected by the interest of a large number of scholars, administrators and local bodies. They are now trying to promote actions aimed to repeat, in this area as in others regions of Italy and Europe, the experience of many archaeological and environmental parks, and of history of the agricultural resources parks, that are conjugating with success the exploitation of the local resources and the safeguard of the environmental and archaeological goods. The objective, in this case, is not to highlight a single monument but a whole historical

landscape, fruit of centuries of human activity on the Petrino Mountain, considered as a container of the human stories for a period that goes from the prehistoric age up to now (Fig. 7).



Fig. 7 – The pentagonal tower of the first fortified village, view from the west side of the Mount Petrino.

Now, in order to respect one of the principles of the Code of Ethics of the Society for American Archeologist (SAA), we support the idea that archaeologists are increasingly concerned about the disclosure of their findings, promoting not only the experience of excavation, but also and especially the communication of the interpretation of the past, so their work does not remain closed within scientific coteries but is aimed at all types of media and public education. This approach we use to found the organization of the Civic Archaeological Museum of the town of Mondragone, which is hosting the permanent exhibition dedicated to all the archaeological results of the investigations on the area, from the prehistoric time to the Middle Age. The big room located in the ground floor, right to the entrance, is entirely to the middle age period and contains some showcases with the finds coming from the excavations and from archaeological survey and didactics panels showing information about the finds and the site. Moreover, thinking about the archaeologist as a “global educator”, we assume that he has to be firstly a good “interpreter” of the past, so we must put the “interpretation” as the first step of “presentation” of the archaeological remains, in a indoor museum as in a outdoor one. In this way the first experiment to communicate to the visitors the shape and the physiognomy of the Castle inside the Museum was a maquette, a model which brings back to its former shape the castle, the walls and the villages in the present condition. This one has been realize philologically in 2002, using the archaeological and topographical drawings of the entire site, with the help of experts artisans in realizing this particular kind of works, coming from the typical Neapolitan crib-art in papier maché.

But the development of the debate on cultural heritage communication joined to the growth of the investigations, stressed us to answer in a better way to these questions: *museology*: 1) what?, 2) for what?, 3) for who?, 4) where?, 5) how?. So we enlarged the *équipe* of researcher, thinking that a communication project for a museum activity must comprehends at least three professional figures like 1) the *curator*, who selects objects, organize and writes contents, so the archaeologist; 2) the *designer* or *exhibition manager*, who produce and install exhibits; 3) the *educator* who organizes materials and activities for schools and general visitors, so the communication expert, who knows the type of the public and his choices and of course the tools to communicate (RUGGIERI TRICOLI and SPOSITO 2004). We began in this way a new path of research and documentation, strongly focused on communication, considering overall that the cultural resource for Mondragone, a small town in the south of Italy, suffering a very critical economic, social and political condition, could be an important, if not the unique, challenge.

The chance to apply a virtual reconstructive method to this fortified settlement was dictated by the high state of preservation of the entire settlement that, though was completely abandoned and with all the buildings ruined, maintains the topographical configuration of the last phase of occupation dating from the late medieval period, with no later building or occupation phases.

(F.S.)

### Technicism and realism in Virtual Reality

The main objective of this study is to create tools of communication that are easy to understand and can be used to develop narratives (storytelling) that describe, using the methods of Virtual Reality, the results of archaeological explorations undertaken in recent years, highlighting the distinctive aspects that gave rise to and shaped the medieval phenomenon of “*incastellamento*”. The methods used in this study are based on specific observations, traces of material culture and the detailed analysis of settlement patterns, with a view

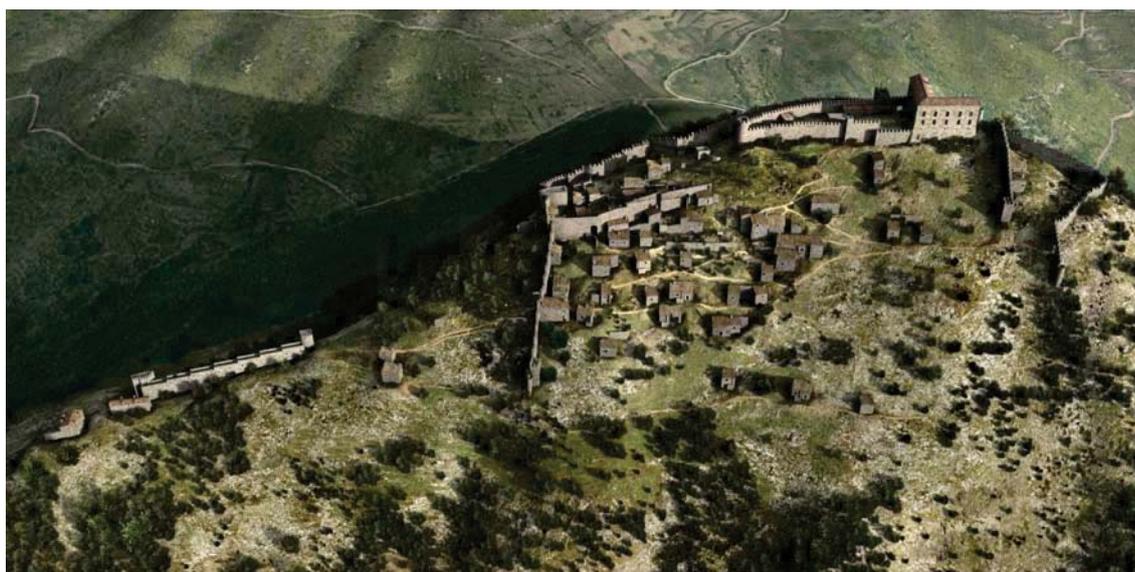


Fig. 8 – Virtual reconstruction of Rocca Montis Dragonis. The complete medieval fortified settlement.

to making general interpretative observations concerning the architecture of the Rocca Montis Dragonis fortress and the social and economic factors that influenced its construction. The aspect of greatest

technological interest in this project concerns the possibility of managing the reconstruction of the architectural complex together with the original arboreal ecosystem. Given that the entire hill on which the settlement stands is covered in thousands of 3D instances, this is highly challenging in terms of managing individual polygonal objects. The management of the mass of trees was entrusted to specific software (Vue d'Esprit Xtreme) which enabled us to manage more than 150 million polygons, rendered with a radiosity algorithm and ambient occlusion, which are known to confer a realistic appearance on the entire reconstruction. The three-dimensional representation of the hill and a large portion of land around it was achieved by interpolation of the contours on a scale of 1:2000. In general terms, the three-dimensional rendering was also convincing in the close-up views. In the views presented here it is possible to assess the final result of this operation, with the ancient complex processed in a range of light and environmental conditions. Obviously, the atmospheric effects are also the result of three-dimensional volumetric simulations: clouds and sun are in continuous movement, not only to enable different readings of the monument at various hours of the day, but above all to heighten the sense of wonder, in a vision that seeks to narrate and represent the past.



Fig. 9 – Rocca Montis Dragonis, views of the surrounding area.

This approach to ultra-realistic rendering is part of a tendency over the last few years, which have seen considerable progress and growth in the technologies used for the study and visualisation of ancient contexts. The specific solutions produced by software companies, in terms of both realism and Real Time 3D applications, are being taken up by increasing numbers of archaeologists and historians. The use of Virtual Reality enables them to give their research and products a more interesting appearance and to provide non-expert users with communication tools that can have great emotional impact. This approach is not just about seeking the most technologically advanced solution, but it is in line with current developments in entertainment and Cultural Heritage communications. Indeed, we are convinced that the effectiveness of Cultural Heritage communications depends to a large extent on freeing representation from the sterile VR interfaces of the 1990s. At that time a narrow technicism was vaunted as evidence of having reached high scientific standards, with results that were defined historically as “cold” – “synthetic images” that were

characterised by their typically computer-generated appearance. The conviction that Virtual Archaeology has no need of extreme realism still persists in some research environments and is often accompanied by reconstructions may be regarded as merely typological or general in character. All this in the age of unbiased rendering engines, ultra-realistic Real Time simulators and CG productions that may truly be said to constitute new forms of visual art. Today representation has to aim at realism and the emotional involvement of the spectator, using the same techniques as modern cinematography. In the project presented here, the realism comes in the simple form of a video, which however has great value from both the emotional impact and the scientific point of view, making use of laser scanning, camera mapping, particle effects, new rendering engines, image-based modelling and other highly advanced modelling techniques. Communication in this case becomes “spectacular” and a vehicle for high-level content, suitable for all levels of user, but created with tools of great scientific value, founded on interdisciplinary research and dialogue between different forms of knowledge.

(F.G., I.F.)

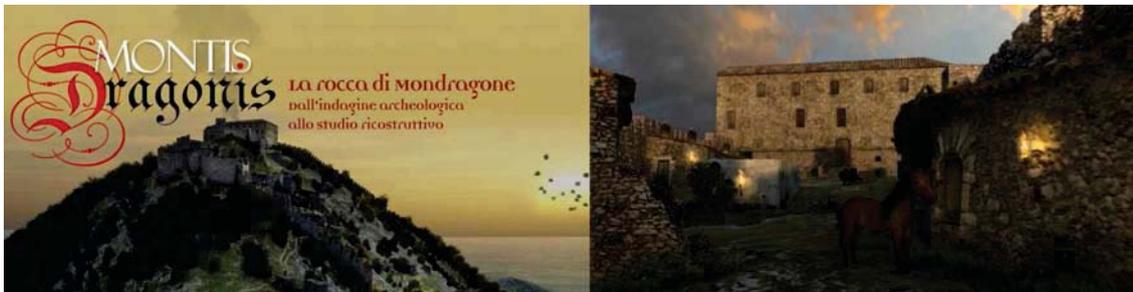


Fig. 10 - Some frames of the Rocca Montis Dragonis video.



Fig. 11 – The 3d model integrated in the simulation environment engine.

### Some final considerations

The topic of this session of the Congress suggested to underline the critical aspects of 3D reconstruction and following this suggestion we would like to remember some considerations on this subject, which helped us to build a virtual tool corresponding to the needs of a realistic construction supported by a scientific grid. The

3D virtual technology has been a fundamental tool for the knowledge and the scientific comprehension of the entire fortified settlement on its original aspect and extension. The virtual reconstruction of the buildings, the walls, the towers, the productive areas, the houses and the cisterns of this “medieval fortified village”, and at the same time of the life inside the castle, enriched by the reproduction of medieval pottery, glasses and weapons, produced an easy and well reading model. This can be used inside the Archaeological Museum of Mondragone, for every kind of visitors and stakeholders (researchers, students, tourists, general public), in particular senior citizens and disabled persons who cannot visit directly the site because its difficult location, on a high hilltop and also for education activities. Finally this kind of application of new technologies to an archaeological case-study, gave the chance to collect all the data deriving from the investigations to realize a scientifically qualified product, suitable to spread information on different on line and off line platforms. We know that the strategies used by media coverage of any indoor or outdoor museum cannot substitute entirely the physical experience of the things to see. Any form of media coverage, particularly that interactive and computerized, can only be a complement of the direct perception of the good, the only one that assure very particular psychological conditions. The direct relationship with the "things", allows a different and more powerful kind of memory than that afforded by other memories, structuring the personality of the subject. Also the virtual reality, like every other kind of representation, could be managed with more or less good results. The risk is as bigger as if it covers items such as archaeological remains characterized by uncertain reconfigurability. This is the reason why a Museum should never take the risk to overcome the meaningfulness of the objects with too exhausted or too invasive stereotyped reconstructions. So, when we approach the way to make the Rocca Montis Dragonis “virtually alive”, we try to keep in mind all these things and to begin from the physical “site”, using the shape of the natural landscape and the scientific results of the investigations on the site to build our work. In order to do this we want to give a correct information about the history and the development of the site, with a good educational perspective which allows a friendly comprehension of the contents. In the final output, the video, we tried to respect a differentiation between the archaeological evidences and the reconstruction, deriving from the difference between the archaeological excavation activities (the complex of data) and the virtual laboratory efforts (the new methodologies applied to cultural heritage). But all these step of the research at the end were mixed together, with the aim to create a useful tool to reach the peculiar needs of this study-case. The first function we respect is to prepare the public to the real visit of the site, already in the indoor Museum. The second one is to give the chance to the public who cannot visit directly the site, particularly uneasy and uncomfortable, to know it inside the Museum in the town and finally the third one is to offer a tool of knowledge to the public who prefer not to visit directly the site, and like to have a only “light” experience of it inside the Museum.

(F. G., F.S.)

## Endnotes

In autumn 1997, financially supported by the Municipality of the town of Mondragone (CE), began a big archaeological investigation program on the site (directed by Luigi Crimaco and Francesca Sogliani), started with an intense phase of topographical analysis of the fortified settlement, introduced by the study of literature and historical documentary sources relating to the Rocca. Since the year 2001, there was going on

annual archaeological excavations, runned by the Civic Archaeological Museum of Mondragone, directed by Luigi Crimaco, in co-operation with the Archaeological Superintendence of Caserta and with the University of Macerata (from 2002 to 2004) and the School of Specialization in Archaeology of Matera - University of Basilicata (from 2008 up to now). The researches are still continuing and in these last two years they benefits of the collaboration of the Institute of Archaeological and Monumental Heritage of the Italian National Council of Researches (IBAM CNR), with Francesca Sogliani, Francesco Gabellone, responsible of the virtual reconstruction of the site and Dimitris Roubis, responsible of surveys and of GIS of archaeological data. The virtual reconstruction of the Rocca Montis Dragonis, done by Francesco Gabellone and his staff in the ITLAB (Information Technology Laboratory) of IBAM CNR (Lecce – Italy), with the fundamental contribution of Ivan Ferrari, has been financed by the Municipality of Mondragone and by the Museums and Libraries Department of the Region of Campania.

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