

The architecture evolution in pre-history: The MOMENT PAST project¹

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ABSTRACT

It integrate the institutions Ferrara University, XXI Comunità Montana del Sarrabus – Gerrei, Soprintendenza Archeologica per le Provincie di Cagliari ed Oristano, Università degli Studi di Ferrara, Politecnico di Tomar, Arqueojovem and Prehistoric Center of Alto Ribatejo. Together we developed a study of 8 sites take in account the new tecnologys to understand how the relation of the man with the landscape was in prehistory and how it is this observable in the arquitecture structures. As contents we will have the works carried out in Isernia, Alvaizere, Atalaia, Carrowmore and Sardinia (always involving all the teams), its linkage with other works carried by the co-organizers and partners in this thematic, an introduction of what is monumentality and architecture, its significance as an European phenomena and its significance in History as a form of landscape domestication, as a remain of a different approach, result of a difference in mentality, in the passage of hunter-gatherer to producers.

With this main objectif in mind we start to create a serial of informatical applications in the study of the sites like GIS, digital fotografies, media contents, WEBGIS, 3D models reconstructions, that was reuned in a cd-rom and a web-page for the public and projected in a serial of exhibition that is happen in most important Museums around the Europe. The exhibitions have not only objects found in the sites, but also panels, multimedia kiosks and other multimedia contents.

To take part of the exposition the co-organizers decided also to develop 11 posters to explain each site and an introduction of what was do it.

At same time the posters give also an abstract of the arquitecture types of the principal "fases" of the prehistory.

This was the easiest and simple way chosen to demonstrate the architectural changes to the general public.

1. TURNING SPACE INTO PLACE

Humans are a contradictory species. Even if we often perceive ourselves as quite fragile, when compared with most mammals, it is a fact that we came to play a dominant role in the environment.

Living is, always, interacting with the environment, and humans do it, as monkeys, or lions, or eagles. And many other species contribute to modify the environment, even in its morphology. Hedgehogs digging subsoil galleries, termites building gigantic towers of clay, bees engendering complex honey fabrics, ... they all modify the landscape, and leave material traces that may be recognised by them and also by other species.

1.1 HUMANS DO THE SAME, AND YET... SOMETHING IS DIFFERENT

This project focused on the human relation with its environment, and in questioning how the practice, then the notion and, later, the concept of architecture, came to play a role as operational tool for controlling the landscape.

We were interested in raising the questions and stressing the similarities, the convergences, the trends, rather than bringing final, and likely controversy, answers.

We may perceive, in this very long and discontinuous process, a trend: towards increasing complexity, increasing domination. Domestication, this notion we often associate with pets and, in a deeper approach, to the origins of food production, is in fact an older attitude.

Domestication as a means to modify surrounding existences and, then, to reproduce such modifications, is to be found in the lower Palaeolithic. It was this attitude that enabled scholars, in the past, to look for evolutionary typologies, even if we question them today. We perceive the emergence, over a million years ago, of a technological intelligence that materialises itself in the organisation of occupation floors, and later in the production of specific tools, where function and aesthetics converge (as in bifaces). These may be seen as the earliest forms of landscape domestication, always associated to increasing social interaction, or what may also be considered social intelligence: the capacity to design group strategies

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for achieving increasingly more mediate goals. We may perceive it already in Isernia La Pineta, in Italy. Fireplaces, mastering one of the primeval elements that pre-Socratic philosophy would identify millennia later, were a major step beyond in this trend. The space of the humans is, for the first time, not only different but also made inaccessible to others. The control of fire must have been something extraordinary at the time it was first obtained, almost 400.000 years ago. It still is one of the greater emotions and challenges every child experiences in the process of discovering and constructing the world. Fireplaces, like the one from Ribeira da Ponte da Pedra, in Portugal, changed diets and social dynamics. But it also introduced an element of irreversibility of human constructions. Where as so far architectural constructions were cumulative physical additions of elements (stones and bones, mainly), fireplaces introduced a chemical element into the process, hereafter unique in intentional natural productions: wood turned into ashes, burned clay, cremated bones, stones fragmented by the heat...

Isernia and Ribeira da Ponte da Pedra are, today, material remains of virtual architectural constructions. Most of these constructions, though, have perished, being made of mainly organic, brittle, materials. To a large extent we have to imagine how they really looked like, and this is also the task of 3D reconstructions, a powerful interpretation tool made available for archaeology today. They stand, nevertheless, as the oldest evidences of anthropization of the landscape by our species.

Durability, in the form of material architectural option, would only be generalised much later, as a strategic option of pastoral societies, even if a major previous modification of the landscape, both irreversible and smooth, was still an invention of hunter-gatherer modern humans, over 40.000 years ago: rock art. Isn't it landscape architecture, as may be recognised, still today, in the C \hat{o} a or Tagus valleys in Portugal? This project, though, was not concerned with what today we call art, but with its alter ego.

So we've looked into the megalithic world. Funerary constructions for eternity, as a perpetual bound between past and future, mediated by their contemporary builders. The complexes of Carrowmore, in Ireland, Rego da Murta, in Portugal, or Pranu Muttedu in Sardinia, cover almost three millennia time span, between some 6.500 to 3.500 years ago, but they share many features. They all seat in transition landscapes, as a product of cultural admixture and diversity: Mesolithic and Neolithic in Ireland, Inland and Coastal Neolithic in Portugal, Megalithic and Hypogeum in Sardinia.

Architecture imposes itself as a systematic way of building the landscape. No longer as a temporary or smooth way, but with a major aggressiveness, a sense of final possession of the land. This is done through the ancestors, which become more important than any mythical animals (bears, lions or other, like we may recognise in hunter-gatherer groups). Megaliths convey a new approach to landscape, one that excludes the other species and aims at dominating the whole environment. No longer by merely creating spaces of refuge (huts, caves), but by creating a human-made web of built structures. An attitude that emerges in societies that will, very fast, domesticate other primeval elements: water, retained by dams, the soil, controlling agriculture, and even the wind, using it for sailing for instance.

Our excursion ends with the Nuraghe of Goni. As in many other regions in Europe, funerary megalithic constructions leave the stage for new stone monuments that are devoted to living activities, even if remaining sacred places. The architecture of the dead is gradually submitted to the architecture for the living. Ancestors' legitimacy is still required, but no longer the major social bound. The whole landscape is, now, a piece of architecture, and soon philosophers will start reflecting upon it.

2. THE PERISHED STRUCTURES FROM PALAEOLITHIC TIMES – ANCIENT TRACES OF HUMAN INTERACTION WITHIN THE LANDSCAPE

Humans began to step out of nature, to search for an independent position shortly after their emergence. We consider that the landscape is constructed whole, both physical, through the anthropisation when creating new environments, and symbolic, through the capture of that specific environment in cultural and cognitive manifestations and representations. Nevertheless, regarding the Lower and Middle Paleolithic this second dimension of the landscape is quite inaccessible. Actually, when we deal with such ancient realities like the one of Ribeira da Ponte da Pedra or Isernia la Pineta, at present time we can only dare to draw some possibilities concerning the landscape use and its consequent transformation by the hunter-gathers.

Such constraint is a consequence of the rarity and feeble visibility of human traces, but as well of a limited archaeological enquiry, centred on the study of lithic remains.

In the last decade a programme of research, which includes the study of Ribeira da Ponte da Pedra, has been developed focusing on human dispersal patterns and their interference with the landscape, in particular the vegetation, habitat preferences, technological evolution and social organisation.

Concerning the Lower and Middle Paleolithic of the Alto Ribatejo, the understanding of human landscape use and transformation is articulated in the following questions:

- How did ancient humans use the landscape and its resources (for example what animals were they exploiting and how were they obtaining these animals; what plant resources might have been available)?
- Which environments did humans aimed at and in which environments were they absent?

- Can we reconstruct a generalised habitat preference?
- Are there any chronological or spatial patterns evident in the lithic records of this period? If so, what do these mean and with which might they correlate?

This quest faces some difficulties since we observe a static archaeological record in order to achieve and understand behaviours driven by an intense mobility. This one is considered as the strategic displacements of the residential settlement, from a location to another, in order to obtain subsistence resources as raw material, animals and plants, water and combustible. The recognition and understanding of such mobility is rather complicated when faunal and organic remains are lacking. Nevertheless a multidisciplinary approach integrating archaeological and environmental data with the Quaternary chronostratigraphical framework gathered and combined by a Geographic Information System, allow us to observe some elements related with landscape use.

The density and location of sites in the Alto Ribatejo already provides scope for such purpose.

We observe that the Lower-Middle Palaeolithic sites are frequently associated with small tributaries of the Tagus river. Apparently these hunters-gathers preferred the small valleys bordering on the large river plain of the Tagus where raw material was largely available, as well as animals and plants.

In spite of the referred lack of faunal remains in the open air sites of this region, the non-existence of extremely cold periods, as well as the faunal remains of the middle Palaeolithic open air site of Foz do Enxarrique, indicates that these hunter-gathers probably were in pursuit of large mammals like aurochs, horses, bears, red deer and eventually mammoths.

2.1 RIBEIRA DA PONTE DA PEDRA: DEPICTING A PALIMPSEST

The stratigraphic sequence of this site, from the middle fluvial terrace Q3 to the lower terrace Q4a, evidences that this location was repeatedly visited in an intensive form by ancient humans. Such reiterative occupations might have not DEEPLY transformed the landscape, but they surely began a millenary relation of space appropriation.

In fact this site located in a slope of an ancient valley where tertiary deposits, quaternary terraces and colluviums alternate, might have the key for the problematic concerning the Tagus river terraces evolution. The place chosen to excavate is directly related to such problematic, to characterize the lithic industries associated, as well as the one of strategic emplacement in the landscape.

Presently we divide the intervention in three sectors west a (base of Q3), west b (colluviums deposit between the two different terraces) and West c (top of Q4a). In this sector we are horizontally enlarging the excavation area, particularly now that a paleosol was identified, containing a fireplace.

The lithic implements show general resemblances in both sectors, being this one a consequence of the almost exclusive use of local raw material: quartzite pebbles. The assemblages are composed by a majority of flakes, most of them non retouched, worked pebbles and some cores. Although the industry is currently under study, some technological differences can be pointed between the Sector west a and c, namely the presence in this one of bifacial pieces and elements which is integrated in the Levallois and discolite methods of *débitage*.

While the determination of internal settlement organization is essential to link with the patterns of mobility and, in general, landscape interaction, the paleosol of Ribeira da Ponte da Pedra, which preserved a fireplace, is extremely important. Even more since the total reconstruction of the landscape use patterns must necessarily start by the determination of the specific function of each site. Consequently we must undergo technological studies of the lithic implements and its intrasite spatial distribution. Wear trace studies were not performed so far, but the analysis of the Fonte da Moita (located in the middle terrace Q3) lithics showed an intensive work of wood, which necessary implies an intrusive interaction between these communities and the landscape.

Certainly wood branches were needed to create and maintain the most ancient and evident construction of the Alto Ribatejo.

The Ribeira da Ponte da Pedra fireplace (Fig. 1) presents a sub-circular shape (=90X150 cm) with perimeter stone elements and burnt sediments.

This structure was built with local raw materials presenting clear signs of rube faction. The top of the structure was excavated, allowing to detect that the burnt grey sediments are beneath the termoclast, most of them being large and horizontally disposed. Due to the open nature of the site and the specific location of this structure on the base of the slope, a cast was made in order to preserve a rigorous copy of the structure. Naturally the rarity of such constructions in the middle palaeolithic also justified this work.

Fireplaces associated with lithic implements, and even though we lack faunal remains, can give us an enormous information to interpret the human behaviour resulting in the accumulation of activities as stone knapping and fire management. These elements are very important to reconstruct the settlement occupation patterns of middle paleolithic hunter-gathers. We hope that the study of this structure and associated lithic industry, eventually the identification of other structures, will provide a more profound knowledge of construction planning degree and expedient organization of the Neanderthals within this landscape.

2.2 THE SITE OF ISERNIA LA PINETA – THE LIVING FLOORS FROM THE MIDDLE PLEISTOCENE

The exploration and study of the deposit at Isernia La Pineta are carried out in collaboration between the Dipartimento delle Risorse Naturali e Culturali of Ferrara University and the Soprintendenza Archeologica del Molise.

The area under excavation covers several hundred square metres; it is covered by a pavilion housing the laboratories for the restoration work, study of materials, and treatment of the data banks and living floors using GIS.

Recent research performed on the site allows a completely new interpretation to be made of how the ancient living floors were formed (3c, 3a, 3S10), mainly thanks to the extension of the explored area.

These archaeosurfaces are the result of behaviours arising from specific strategies directed at obtaining meat for food consumption, and are borne out by the palaeogeographic reconstruction of the area, the deposition and distribution of lithic and bone finds, the technical and typological characteristics of flint cores, as well as by the operative sequence adopted by prehistoric humans for their knapping and use.

The three living floors are apparently different facies of a single settlement phase, which the sequence of events surrounding its burial lead to be erroneously attributed to separate archaeological layers, from a chronological point of view.

The common element shared by all three living floors is the humid environment present in the area at that time: this can be seen from the partly-emerged travertine formations, evidencing a fairly continuous horizontal, linear progression.

The gradual increase of these formations – caused by flowing water – is documented by the exposed sections and excavation relief's testifying typical structures linked to this phenomenon. It appears likely that the entire area was characterised by a reticulate, with a myriad of small lakes or pools leading into one another.

The excavation work unearthed a large quantity of lithic material on the long, narrow surface of one of these relief's surrounded by water; these finds are in a very good state of preservation, mostly consisting of flakes obtained by direct percussion or on an anvil², their surfaces showing frequent traces connected with butchery (L. Longo, personal communication). Bone remains instead are very scarce, becoming very frequent at its edges, where water was present; flint artefacts are infrequent here, and present translucent surfaces to indicate their immersion in water. The bone/flint ratio thus changes in relation to the area, i.e. reliefs or the lower humid zones.

Furthermore, in the sunken areas we can distinguish the three different living floors (3c, 3a, 3S10), which become joined in a single layer at the level of the travertine bar, on the higher ground.

Volcanic deposits (cinerites) fill in the sunken areas; separating the archaeosurfaces and tending to level out the whole area, and rise up – like the living floors themselves – along the sloping edge of the travertine bar towards the lake area. In some places the extension of the travertine invades part of the living floors.

Bearing in mind the numerous studies on the lithic and faunal finds of the area, the interpretation of these data informs us that prehistoric humans adopted specific and productive subsistence strategies. The stable occupation of the travertine relief's surrounded by a lacustrine environment afforded the human group the necessary refuge and protection, while exploration of the surrounding territory offered the opportunity of recuperating animal carcasses, or parts of these, for food consumption. The carcasses were carried to these areas – decidedly safer than on the open plains – where they were butchered and further exploited by fracturing the bones to extract the marrow. The considerable concentration of faunal remains in the humid environment close to the relief (which was noted from the very first stages of research 4) leads us to believe that they were deliberately thrown there. The immersion of organic remains still rich in organic material ensured they did not draw the attention of carnivores.

2.2.1 THE GIS APPLICATION IN ISERNIA LA PINETA

The Lower Palaeolithic site of Isernia La Pineta (Molise, Italy) were explored extensively over an area of about 300 sqm and were yielded an enormous quantity of lithic objects and faunal remains.

As a management form of such a quantity of data collection a GIS system was chosen for its unlimited possibilities of alphanumerical and graphical data collection, of visualisation, analysis and processing. In this way, the choice of making the excavation area a museum has allowed a new reading of the informatic application to archaeology, as the informatic management wasn't conceived *a posteriori*, but it follows every research phases from the excavation. In fact the construction of a pavilion covering the whole surface offers the possibility to have a computerized workstation on the site and a Total Station, a computerized theodolite, with which every measurement and the cartographic relief of excavation surface are carried out.

A precise methodological rout was arranged, giving us the possibility to homogenise the previous data, which are part of the historical archives already documented and recorded, and the new ones.

The establishment of a computerised process to describe the characteristics of each individual find is a decisive step towards any subsequent organisation before any queries as to possible variables and any associative or quantitative statistical analysis. An accurate analysis of the variability of each attribute is necessary prior to any precise thematic selection from the various records.

The logical and physical structure employed in the description and organization of informative level reflected the following research objectives:

- Conversion of paper archives to a digital format;
- Localization and two- and three-dimensional visualization of all the finds;
- Processing of archaeological entities as spatial variables;
- Spatial interrogations (topographical selections, pilfering out of post depositional noise) to attempt to reconstruct possible natural and/or anthropic post-depositional processes that transformed the original deposits, and the modes and phases of the frequenting of the sites through the thematic decomposition of spatial distributions and the creation of individual or combined plans and thematic sections;
- Statistic inference of spatial data (frequency matrixes, density analyses) to highlight significant associations and connections between specific categories of materials, potential indicators of the presence of functional areas.

In fact, the GIS is not only a manager tool, but above all a powerful tool to process spatial analysis, that have long been one of the most important methodologies for the study of the formation of paleosurfaces in prehistoric deposits, whose reconstruction undoubtedly plays a decisive role in the validation of subsequent deductive analyses.

The close connection between the spatial location of the evidence and the analytical study of each individual find makes the use of computer spatial analysis technologies especially useful in conjunction with GIS. If the spatial distribution of evidence reflects the functional organization of an investigated surface, quantitative statistic techniques can be very useful for the classification of finds, the analysis of the overall evidence, and the detection of specific associative patterns. GIS applications allow the visualization of different distributive levels for specific categories of objects; more importantly, they can highlight "latent structures" in the distribution of artefacts through the construction of a thematic cartography (Fig. 3).

3. A NEW CHANGE IN THE ARCHITECTURE, A NEW EMERGENT THOUGHT: THE FUNERARY MONUMENTS

Between the 6th and 1st Millennia B.C. a major change occurs in the architectural archetypes in Europe.

What was as a characteristic building perishable style, where all the elements are as one with nature, gave place to monumental elements of an outstanding architectural harmony with the landscape.

There is a widespread demarcation of space accompanied by the socio-economic transformation verified in this period.

The first expressions of landscape modification were elements that were simultaneously removed and reorganized within the space nowadays perceived as *Megalithism*, which holds a variety of meanings: grave, mark, building, effort, domain and change of the environment. The period marks a change in behaviour, not only enclosed in religious meaning, but also the being capable of changing its surroundings, and giving them a new long-lasting meaning.

The use of the term megalithic cannot be considered in a narrow way, since it includes several manifestations, all associated to the change of space perception. This is its unifying sense.

For that same reason, we avoid to speak about the megalithic phenomena or of polymorphism, since these concepts seem to gather a self and complete identity, which in fact doesn't exist. Similarly, it is not to be considered a chronological period.

Dolmens, cromlechs, alignments, tholoi, menhirs, cists, hypogei, and other atypical monuments, as pit-structures or stelae, are some examples of panoply of traditions between remains of local memoirs and migrations of symbolic thoughts that took place throughout Europe. Dispersion of this behaviour varies, presenting an unclear picture on the possible regional dynamics existent in given periods. Only further investigation will enable us to clarify these aspects.

In a retrospective of the simplest architectural manifestations, all research leads us to believe that the first megaliths assumed the menhirs form, those great stones erected as outstanding phallus on the soil.

In a very natural fashion these rock elements were transformed upon the search of a durable reference label, capable of multiple functions but mainly to last through time.

Speculation on the meaning of these elements is wide, standing out the theory of ritual meaning linked to agricultural cults, (innovation that associates the "habitus" and thoughts different from those of the traditional hunter-gatherers) or still to the astrological or fertility rituals previous to the Neolithic period.

For sure we can argue that they express a will of detaching this great stones using a common "modus operandi". The construction using small stones, that later served to support giant stones of several tons, presents evidence of intelligence, and most importantly this behaviour is the testimonial genesis of architectural thinking: to imagine, to plan out, to build. The evolution of this concept develops through a combination of several elements coordinated into spatial formations, technically identified as cromlechs and alignments. These structures are no more than monoliths, assuming a new spatial significance growing into geometric forms, circles, lines, squares that seem to be linked to more complex thoughts as well as social efforts of a more unified primitive society.

With the dolmens, the megaliths appear associated to a structural emergent complexity: a group of great stones, sculpted

in a certain form, and leaned on each other to form one or several chambers, and finally topped up by a large capstone, that covers the monument as a roof.

However the original dolmen was much more than that; it represents not only the capacity to mobilize enormous materials with an architectural purpose, but the capacity of camouflaging these structures transforming them into mounds nearly in harmony with the naturally existing landscape: the mound, present in some monuments. It may be perceived as a juggle between demarking and harmonising with the landscape: of symbolic dualism.

A Dolmen is divided into several sections (synonymous of the architectural complexity), besides the main chamber and the mound that may be present in several forms and sizes, we have a series of other structures that were added progressively: the corridor, the atrium, the buttresses, the outlying ring and the condemnation structures, amongst others. It may be compared to a complex puzzle that varies from monument to monument, being this variation that enables each monument to be singular, we simply dismantle the puzzle and try to tell its tale. Some puzzles are more complex than others; however each one is unique, so that some of these are classified as atypical or not vulgar.

Chronologically more recent monuments are the hypogei, rock cut tombs where the interior displays the same type of characteristics observed in the dolmens, different in architecture but of identical rituals. Just like the tholos, with false corbelled chambers often composed by several structures but less construction effort. Or still of the cairns or cists, these being smaller individual burial monuments.

Many other particular types could be mentioned, some characteristic of some regions, others following traditions and "social habitus" that in certain cases might even have reached extensive areas of praxis, but we prefer integrating them in the atypical classification.

This binomial equation of the old and the new, of the natural and artificial, of the demarcation and camouflage is being affirmed in a new social praxis that inexplicably disperses throughout the whole Western Europe, building the first architectural monuments, with the symbolic objective of not only to render cult to their ancestors, but also of leaving a legacy for the future.

3.1 DOLMEN I OF REGO DA MURTA, ALTO RIBATEJO, PORTUGAL

The Dolmen 1 of Rego da Murta is located in the Central Portugal in the northernmost part of the Alto Ribatejo area (Leiria District) and it belongs to a complex area of 7 monuments spread across of 1,08 square Kilometres. All this sacred area, is embedded in an ancient floodplain and crossed by a small creek, the surrounding areas being higher ground smoothed by erosion with very mound like morphology, where remains of habitat are common and date back to the same period. This is a burial monument, composed by a heptagonal chamber displaying a semi-circular area with 4 meters diameter and a height of 1,55 m, with a corridor orientated SE of about 1,50 m wide and 3 m long. Beside the architectural characteristics of this monument, we may recognise three building periods, leading us to believe that the monument was used several times. The initial phase dates back, probably, to 3500 B.C, when the large chamber was built, followed by a second phase of restructuring and the construction of a corridor. This second phase dates back to the Bell Beaker period, around 3000 B.C.; a third phase dates back to the Bronze age, when the corridor was prolonged, around 2000 BC (Fig. 4 and 5).

Unlike most of the known dolmens in Portugal, this monument was not erected from the surface. Instead, a ditch was opened and part of the structural chamber was buried, facilitating further architectural construction, soon followed the application of a small mound allowing the superior cover to be raised that would finally cover the whole monument.

A similar architectural approach had already been observed in the region, further south, in the Val da Laje 1 passage grave, in the Zêzere valley. Even if the type of the structure is different (c. 4.500 cal. B.C.), also in this case the monument was partially built on an excavated surface, being half-buried from the start.

From the interior of the chamber, at a depth of about 60 cm bellow ground level, rose the corridor with an inclination of 20% towards the surface of the second considered layer of occupation. The monument was violated several times, leaving traces in the disturbed assemblages, being the corridor's area the best preserved one.

The methodology used was based upon recent technology enabling the reconstruction of the site and simultaneously the treatment and analysis of the data available.

All the artefacts were tridimensionally coordinated on site and computerised, along with a description, allowing a relationship between spatial location and descriptive data.

Along with this information a set of digital imagery was collected and related with the sketches allowing its use with the data already computerised for the final interpretation.

The artefacts were treated in the laboratory and also treated as further elements to insert in the digital interpretation of Dolmen I Rego da Murta is know in reconstruction and our main objective is to turn this all area into an archaeological park, expecting that further projects will continue to unify the information in this manner enabling the creation of large and dynamic interpretation centers of European architecture.

3.1.1 THE WEBGIS OF REGO DA MURTA

One of the main aims of this project was the intention to reach the public by making data available in the web.

This would allow the public to accede, not only to linked data and GIS analyses, but would also give the possibility of interaction with the public.

Our first approach to this matter, however, attempted to be the simplest as possible, starting by presenting the archaeological sites connected to the megalithic monuments of Rego da Murta.

The GIS of Rego da Murta was developed in ArcGIS 8.2 of Esri. All the data that came from the site were geo-referenced and transported to the geo-database inserted in the GIS. The vectorised structures and the space referenced objects with X, Y and Z values gave us the 3D perspectives. This information enabled us to reach more conclusions and new answers in a more rapidly and efficiently way. All the related sites were coordinated and inserted in a database.

The GIS information is made available in the web through the ArcIMS extension (for ESRI software like ArcView or ArcInfo). The website is composed by maps in 1/25.000, with altimetry information's, hidrography and archaeological sites (megalithic and others). All the information can be scaled and zoomed in and out. Several themes can be shown at one time. The ArcIMS have some functionalities allowing measuring, colour tools, coded information, print outs or presentation applications, like PowerPoint.

3.2 CARROWMORE MEGALITHIC CEMETERY, IRELAND

The Carrowmore megalithic cemetery covers an area of about half a square kilometre, and the central part of the cemetery extends in a north-south direction. It is about one kilometre long and 600 meters wide. Outside the central part of the cemetery, various other stone built monuments occur, mainly to the north, and altogether 45 sites still exist in the area. So far, 10 monuments have been excavated by the Swedish archaeological excavation campaigns 1977-1982 and 1994-1998, and they have shown that most tombs at Carrowmore were erected between 4300 and 3500 BC CAL.

The layout and structure of the Carrowmore cemetery is clearly that of an arranged ritual landscape, where the tombs have been placed in an oval shape around an area where no tombs were erected. There is a clear tendency that the tomb entrances, in eight out of the ten cases where this can be established, are facing towards the central part of the cemetery that is the tombs on the western side of the cemetery are facing eastwards, while the tombs on the eastern side are facing westwards.

Tomb No. 51, Listoghil, falls outside all the morphological parameters that characterize the other tombs within the Carrowmore megalithic cemetery. Firstly, with a diameter of c. 32 meters, Tomb No. 51 is the largest tomb in the cemetery. Secondly, Tomb No. 51 is reported to have been covered by a large cairn with a height of about 50 feet (over 16 meters) as late as in the 1690's.

Substantial remains of the lower parts of the cairn, including the boulder circle, are still intact. The morphology of the central chamber in Tomb No. 51, with its rectangular chamber and angled limestone roof slab, is that of a portal tomb.

The positioning in the centre of the cemetery, and the original features of Tomb No. 51 gives the monument a significant, focal role in the Carrowmore Megalithic Cemetery context. Moreover, in 1993, circular carvings were found on the front side of the roof-slab, the first appearance of megalithic art at Carrowmore.

3.2.1 VIRTUAL REALITY IMAGING AND 3D-CAD DOCUMENTATION AND RECONSTRUCTION OF STONE-BUILT TOMBS AT CARROWMORE

A detailed, totalstation-based mapping of the Carrowmore area forms the base of a digital 3D model of the landscape. GIS and CAD data have been used together with digital photographs to create a virtual walk through the landscape. The interactive real time visualization of the environment and the megalithic tombs makes it possible to study, e.g., tomb positioning and direction, intervisibility between tombs, and relation to surrounding landscape features. Also, simulations of vegetation may help to reconstruct the ritual landscape at 3500 BC, as well as construction sequences of individual tombs.

During the 1997 excavation season, a detailed totalstation-based documentation of Tomb No. 51 was carried out. The aim was to create an exact digital reconstruction of the tomb (Fig. 6), for documentation purposes as well as for the presentation and visualisation of the monument in the Visitor's centre after the reconstruction of the monument itself. More than 2000 measuring points were taken for the CAD drawing (MicroStation95).

3.3 HAGADÖSEN AT ORUST, SWEDEN

A detailed totalstation-based documentation of the Hagadösen was carried out in December 2003. The aim was to create an exact digital reconstruction of the tomb, for the presentation and visualisation of the monument in the Project Moment Past.

More than 200 measuring points were taken for the CAD drawing (ArchGIS and 3D Studio Max) (Fig.7).

A detailed, totalstation-based mapping of the Hagadösen forms the base of a digital 3D model of the tomb. GIS and CAD data have been used together with digital photographs to create a virtual model of the tomb. The model can be used to help to reconstruct the tomb as it was at 3000 BC.

In the excavation in 1915 they found among other things pearls of amber, a stone axe, a flint dagger and a pendant made of slate.

Those artefacts are visualized in 3D so that they can be seen on the Internet, and also rotated and zoomed in.

The dolmen is located high up in the landscape overlooking the bay which was, during the Stone Age, covering the meadow beneath. The Stone Age shoreline was about 10 meters below the dolmen and north of the dolmen another bay was spreading.

The area is full of remains from both Stone Age and Bronze Age.

Beside the megalithic monuments there are mounds of stones, burial mounds, grave-fields.

The Haga dolmen was probably erected as a single burial tomb. The sepulchral chamber is built of four standing stones and one capstone. Originally the dolmen was surrounded by a mound of earth and had a circle of smaller stones around it.

3.4 THE MEGALITHIC TOMBS OF PRANU MUTTEDU, SARDINIA

Moreover, the large necropolis contains an alternation of hypogeal tombs (the so-called “domus de janas” of the Sardinian tradition), in simple, one-cell, or two-cell plans, excavated in the sandstone, and a vast range of megalithic “chamber” tombs.

These all have peristaltic circles made up of large blocks, which present alongside each other in two rows or in circles or even arranged in concentric terraces in a wall formation, which were meant to contain and support the tombstones placed on top, but are different in their inner plans, being adapted according to the circumstances to group or individual burials, and perhaps to the social class of the deceased that was to be buried in them.

The circles, which open on orthostatic corridor entrances, as a matter of fact enclose inner chambers of several shapes, which include the following elements: “domus de janas” small cells obtained from monolithic blocks accurately decorated with sculptures, carried from afar and placed on beaten sand and clay grounds, in the middle of chambers built in radial proliferation; one-cell chambers elongated with an apsed end, built with masonry made up of small boulders, with a rectangular hatch entrance and lowered flooring level; two-cell chambers with a sepulchral quadrangular cell and transversal elliptic antecell on the entrance axis; and large quadrangular basket-shaped dry walls which include large menhirs of different heights.

For all burials, tabular roofs or pseudovault roofing with overhanging corbels are hypothesized recalling the western dolmen tradition. The materials found in the different burials – a miniature basket vase, a miniature pyx, and a bowl, all decorated with engraved motives, a spheroid pommel, a dagger and a stylet made of flintstone, a few flintstone swords, and a few obsidian arrowheads, besides two silver necklace beads – can be chronologically included in late Ozieri culture contexts, in the passage between the late Neolithic and the early Chalcolithic.

This is the direction pointed by the analysis of the burial architectures of the necropolis. Though indicating what so far is seen as the most ancient expressions of pre-Nuraghic megalithism in the sub aerial transposition of structures consecrated by the most archaic funerary hypogeal experience, they actually present hybrid morphologies that seem well to adapt to pre-existing epigeal models of the dolmen tradition found predominantly in the west.

The megalithic necropolis of Pranu Muttedu is located in southern Sardinia, in the region of Gerrei, at about 2 kilometres as the crow flies south west of the modern village of Goni. It extends over a sandstone schistose platform slightly over 500 metres above sea level, covered by dense vegetation made up of Mediterranean maquis and centuries-old oak tree forests.

Not far away, north of the plateau, is the site of a village of huts referred to the late Neolithic (3.500-2.700 B.C.) and more specifically to later phases of the “Ozieri Culture”, which is probably to be related to the necropolis, with which it shares the same chronological and cultural context.

The vast cemetery area (studied by Prof. Enrico Atzeni – University of Cagliari and Dott. Donatella Cocco – State Archaeology Service for the Provinces of Cagliari and Oristano), a sacred place associated with the cult of the ancestors, is marked by fifty odd menhirs, the largest collection found so far in Sardinia.

The menhirs are arranged in pairs, small groups, or in alignments, the longest of which contains twenty along an east-west axis, with clear reference to the course of the sun’s passage and religious meanings associated with it. They are menhirs rising up to three metres in the so-called “protoanthropomorphic” form, with ogival or subogival outline, flat ventral surface, and convex dorsal surface, shaped carefully and accurately with chip hammers.

The intention is to give simple characteristic features to whatever the menhir was supposed to represent: a divinity, a generating force, or an intermediary towards heaven.

3.5 PREHISTORIC SITE OF DOMUS SUAS, SARDINIA

The corridor is made up of stones of variable sizes arranged in rows of a thickness of 1.50 metres in double screen, which is well preserved for about 2.25 metres in the end part by the inner surface of the corridor which again is arranged in rows.

An outer circle of orthostatic blocks in the longer sides seems to match the part of the entrance that creates a sort of very irregular exedra. In spite of the irregularity of the exedra, a sort of antechamber of 3.75 metres by 7.50 metres can be seen.

The inner corridor is legible for a length of about 10.50 metres, since the part facing the exedra is invested by a large collapse. The difference in level between the treading floor of the corridor and the floor so far studied in the exedra suggests the presence of a descending staircase under the collapse. This staircase must have led from the exedra to the funerary chamber.

The funerary chamber has an average width at the two extremities of about 1.63 metres with a narrowing in the centre that reduces the width to about 1.12 metres.

The hypothesis that the monument was excavated in not too remote times, justified by the difference in colour that can be legible in the soil after removal of the superficial layer, is confirmed by the fact that, apart from a Roman anvil lamp chronologically framed between 15 BC and 20 AD, no other materials were found during the excavation of the end part of the corridor. The only clear sign of the presence of an exedra is provided by a sort of entrance of a width of 0.75 metres limited by two small orthostatic slabs. Near this entrance one seems to recognise a sort of small door 0.75 metres by 0.625 metres leading into a corridor of 3.75 metres by 7.50 metres.

Though not completely clear, the thickness of the exedra is only legible in the North West side reaching about 1.785 metres.

On the whole the monument reaches a length of about 19 metres by an average width of about 6 metres.

Another corridor tomb has been highlighted not too far away from this one, of a slightly different typology, since on a first analysis it appears to be orthostatic. Thanks to an excavation, it was possible to single out a double curtain wall on the south side. The exedra was not identified, and this suggests an allée tomb, though it would be necessary to carry on the investigation in order to make better supported hypotheses on the typology of this monument. After clearing and excavation works had been carried out, it was possible to better highlight a circular structure next to the allées, preventively indicated as a Nuraghe, leading to new interpretations of the monument.

This structure is in fact a kind of tumulus with some terracing, which considering its proximity to Pranu Muttedu, could suggest that a hypogeum between megalithism and burial could be revealed inside it. The partial discovery of a sort of inner space inside the structure should be mentioned. This element, which becomes visible simply by moving one of the stones that define the inner chamber, about two metres deep, could suggest that the monument should be classified among the "navetiform" typology of corridor Nuraghis. The diameter of the inner chamber about 3 metres, while the wall defining it is about 2 metres thick on the northern side.

A sort of outer circle or structural ring of difficult interpretation has been discovered around this chamber with a wall thickness of about 1.75 metres and a diameter of about 12.50 metres. A circular semi tower that tends to close on the outer circle seems to be legible North West of this ring at a distance of about 3.75 metres.

This could indicate a subsequent addition, which can also be seen at about 6.75 metres in a north east direction. This reading is in some way supported by an analysis of the plan of the monument by aerial photography.

The prehistoric site of "Domus Suas" located in the immediate neighbourhood of the village of Goni (CA) is easily reached both through a small by-road in the vicinity of the built up area, and through an access next to urban tract of the river Rio Su Bau. The site has been the subject of archaeological investigation under the scientific management of Dr. Donatella Cocco of the State Archaeology Service for the provinces of Cagliari and Oristano.

After clearing works and partial excavation of the site, it was possible point out two allées couvertes both oriented towards west, which by typology testify to a sub aerial hypogeism extensively attested at Pranu Muttedu.

Elimination of the superficial layers and partial removal of an underlying collapse showed an alignment of stones along the west side that seemed almost to link together the two monuments above the ground: an obvious sign of subsequent rearrangement.

These alignments, which are perpendicular to each other, can only be seen on the west side and on the north side, and seem to define a square of sides of 2.75 metres of a thickness of about 0.25 metres in the most significant remaining blocks, arranged at times orthostatically and at others in rows.

Few materials were found: a few ceramic fragments chronologically framed in the II Middle Bronze Age (Dott. Vincenzo Santoni) and fragments of amphorae, which together with related food remains seem to confirm the frequentation of the site in historical times.

Particularly interesting is one of the Tombe di Giganti (Tombs of Giants) present on the site in a sort of curvature in the corridor, in the unique exedra typology which appears elongated in shape and with closed wings to form a sort of corridor which is still of difficult interpretation.

In its present condition this particular plan seems to represent something unique.

The tomb in a south-west orientation can be defined epigeal, megalithic, and of the stone row type. Its outer surface defines the corridor of orthostatic blocks, which is better preserved on the north western side, while on the south eastern side they are aligned irregularly due to a collapse, which also made the corridor narrower. The south eastern sector is characterised by a change of altitude, probably due to agricultural works and to the presence of an olive tree whose roots invade the terminal part of the monument.

4. THE NURAGHE OF GONI

Located northwest of the village of Goni, the Nuraghe of Goni rises on a plateau that dominates the surrounding valleys. It is made up of a circular tower, of about 10 metres in diameter at the base, with an architrave entrance, about 1.40 metres high, facing south-south-east and surmounted by a discharge crack.

Access to the chamber is through an angle-section corridor, 2.50 m long, which reveals the mouth of a deep niche on the right side: the original recess for the stairs that must have led to the terrace collapsed almost entirely in ancient times (except for the last five steps, which are still visible today) and was adapted as a sentry box.

The chamber has a circular shape, with a diameter of 4.40 metres and "tholos" roofing obtained by the regular overhang of concentric rows of sub-squared blocks closed at the top with a sealing slab. (Fig. 8)

Three large niches open inside the chamber, located in relation to the entrance at the bottom, on the right, and on the left, respectively. The left niche leads on to a small narrow space, whose function is hypothesised to have been that of a storeroom.

On the left side of the chamber, between the entrance corridor and the large niche on the left, at a height of about 3.35 metres, is the triangular opening of the stairs recess that leads to the terrace. This was of a triangular section and had small windows through which it received light.

The very steep staircase, made up of narrow steep steps, is built inside the wall of the tower, in the tract between the large niche on the left and the corridor.

The structure of the outer wall of the Nuraghe is of the sub squared type. In it two different building techniques emerge: up to a height of 3 metres it is made of regular successive rows of very large quadrangular and many-sided blocks; while on top of the large blocks neat rows of long narrow slabs stand out.

A set of well-squared ashlar, supposedly belonging to the terrace parapet, rounds off the top of the tower, while plinth reinforcement made up of two clear rows of large sub-squared blocks of marl and sandstone are set around the base of the tower.

The Nuraghe rises on a sub-elliptic platform limited by bank walls, which adapts perfectly to the morphology of the tableland, following the natural lines of the rock integrated in the masonry.

Based on the above it can be deduced that the Nuraghe was built at least in two phases, both attributable to the Nuraghe period, which cannot be identified with greater precision for the time being due to a lack of stratigraphic archaeological excavations.

5. A LANDSCAPE OF PLACES

The space is the primary dimension of human groups' behaviour. Time may be neglected, or compressed, or extended.

But space is the stage for existence, even when this existence is considered illusive.

Space is, also, the result of a primary perception. In this sense it exists in the individuals eyes before existing in the collective minds. It is a result of cross-cultural evidences and references. The space of a group may incorporate or not a given mountain, or this stream, or that tree. For millennia, gold was not part of the prehistoric people space, simply because it wasn't part of their needs and abilities.

This space, as seen from within the cultures, is a network of places, of locus.

The place is named, and so is the space.

Our concept of space does not exist.

Space is always land, belonging and place.

And it is within this network that cultural frontiers are built. The Sardis, or the Swedes, or the Italians, or the Portuguese, recognise their places beyond any other economic or political constraints. As do the !Kung, or the Balantas, or the Tuareg.

The people's space is always the land of someone, or no-man's-land. But it is never a mere geographic territory. And it is, hence, always a cultural and historical construction, depending upon points of view.

It is in this space of places that the human adventure takes place. But we accede to it always as foreigners, always from the outside. And what we see is not the space of prehistoric people, but our perception of it. And the best we can do is to characterise the catchment's resources, the potential territory. It is by no accident that our books are filled with air-photographs and maps: quite useful, providing we remember prehistoric people could not fly, and that their possible maps were conceived from a ground perception.

Territorial analysis is essential, because it defines the constraints of human habitats. But its value is restricted to this.

It does not tell us anything about human behaviour, because this is always cultural, not a mere adaptation to the environment.

The space of prehistoric people, as ours, is always a Man-made Nature. It has to do with identity.

Identity is based in equilibrium between conservation and innovation, governed by social interactions that take into consideration material and immaterial memories, which operate as a sort of ethnic auto-biography. Heritage came to play, in contemporaneous society, the role once belonging to the founding myths, formerly boosting national rivalries (a vision

dominated by the aesthetic perspective) and now stressing diversity and tolerance concerns (a vision incorporating all memories, all landscapes).

Prehistoric architecture, this dialectic attitude of adding constructions that change but harmonize with the landscape, is also about our identity as a species.

This is a new and unsuspected memory, which is twice brittle: for its instantaneous dimension, since it is re-elaborated and reviewed constantly, and for its minor consideration by the public authorities, still concerned, mainly, with the former, ethnic driven, approach.

We face, today, the task of interpreting and managing a new and endless Heritage that pervaded all societies, raising new challenges, while focus on monumental sites still prevails, even if the landscape approach is emerging.

Isernia la Pineta, Ribeira da Ponte da Pedra, Carrowmore, Rego da Murta, Pranu Muttedu, Domus Suas, Goni... these places are inscribed in a changing landscape, in which we now live, and that was, in the past, a mosaic of increasingly interconnected locus. To interpret how they came to exist is to recognise our own nature.

CONCLUSION

Looking at the surrounding environment Man came to understand himself, by modifying the environment he identified as his own, he gave meaning to it, turning it into his place.

Architecture is this: to introduce changes into the landscape so as to meet human needs.

These first interrelations with the landscape date back to the Palaeolithic period (construction of spaces of refuge, selection of spaces for hunting, carving of artefacts, areas with symbolic or ritual meaning, among others), which for being of difficult preservation were lost in time.

Later, the association of different behaviours led to the emergence of a mental complexity transmitted by new meanings expressed by feelings, emotions and intentions.

Thus was Man constructed his own Universe. By recreating the landscape we transform it into his own space, a space at his own image.

It's in this interaction that we go on living and transmitting concepts to our dwelling space.

FIGURES



Fig. 1 – Ribeira da Ponte da Pedra, Portugal. Fireplace view from South.

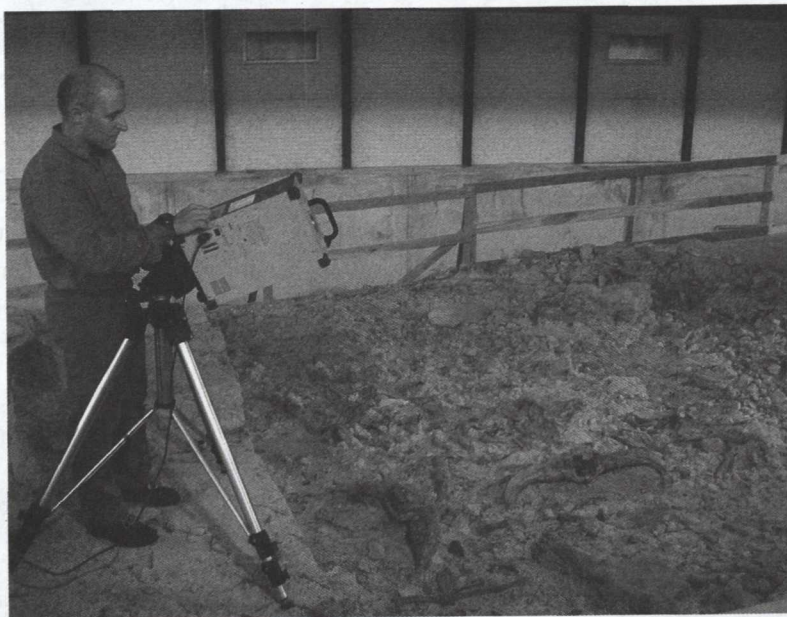


Fig. 2 – Isernia la Pineta, Italy. A color 3d scanning.

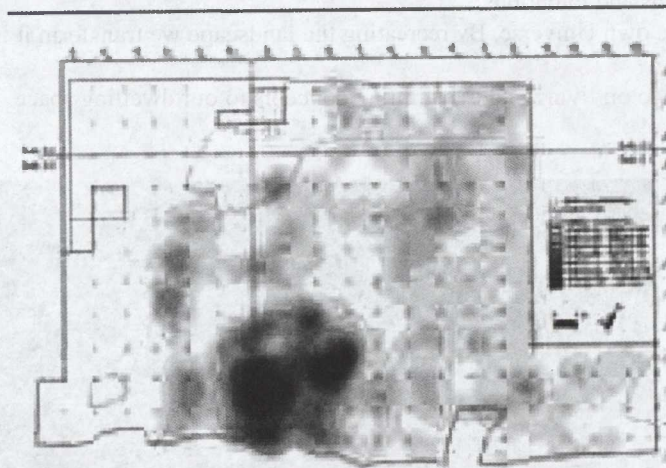
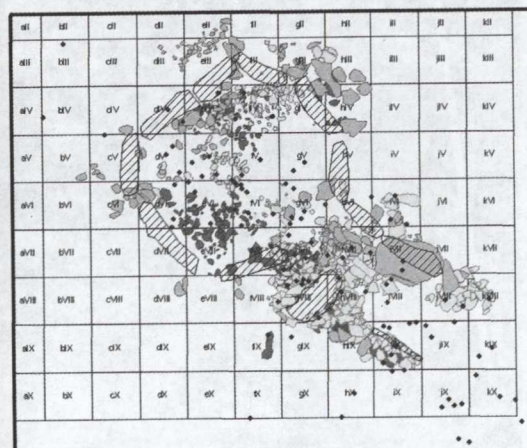
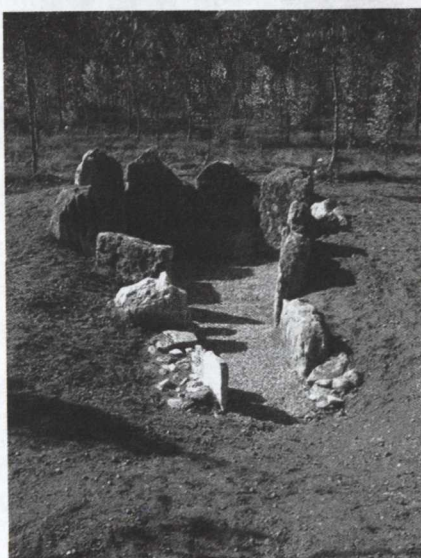


Fig. 3 – Isernia la Pineta, Italy. Archaeosurface 3a, I Sector. Density areas of all the remains.



Andrao-Andrao 8.2
Alexandre Velho 2004
Font: Digging drawing
Data 1999-2003



- Legenda**
- esteios
 - 1 camada 0 a -0,70
 - 2ª camada -0,70 a -1
 - 1 a -1,20
 - Inferior a 1,20
 - Quadriculas
- Subtipo**
- Lamela
 - Lâminas

Digging projection
Monument center - Zero point
Quadrant 1:1 meter

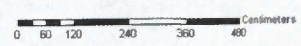


Fig. 4 and 5 – Monument I of Rego da Murta after the digs and the GIS representation of the flints remains.

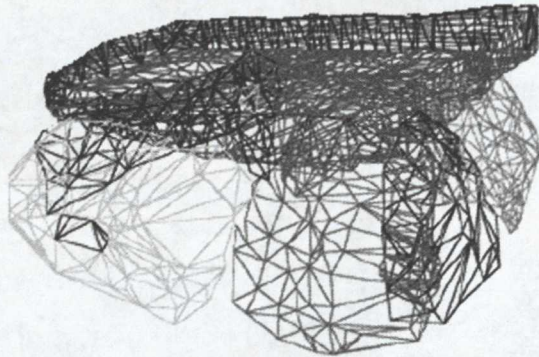


Fig. 6 – Carrowmore, Ireland. Digital reconstruction of the tomb 51.



Fig.7 – Haga, Sweden. 3D model of the tomb.



Fig. 8 – Nuraghe monument of Goni, Sardinia.