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Methodological approaches
for the enhancement of cultural heritage

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Santina Di Salvo

METHODOLOGICAL APPROACHES FOR THE ENHANCEMENT OF CULTURAL HERITAGE

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La collana editoriale Esempi di Architettura nasce per divulgare pubblicazioni scientifiche edite dal mondo universitario e dai centri di ricerca, che focalizzino l'attenzione sulla lettura critica dei progetti. Si vuole così creare un luogo per un dibattito culturale su argomenti interdisciplinari con la finalità di approfondire tematiche attinenti a differenti ambiti di studio che vadano dalla storia, al restauro, alla progettazione architettonica e strutturale, all'analisi tecnologica, al paesaggio e alla città.

Le finalità scientifiche e culturali del progetto EDA trovano le ragioni nel pensiero di Werner Heisenberg Premio Nobel per la Fisica nel 1932:
«È probabilmente vero, in linea di massima, che nella storia del pensiero umano gli sviluppi più fruttuosi si verificano spesso nei punti d'interferenza tra diverse linee di pensiero. Queste linee possono avere le loro radici in parti assolutamente diverse della cultura umana, in diversi tempi ed in ambienti culturali diversi o di diverse tradizioni religiose; perciò, se esse veramente si incontrano, cioè, se vengono a trovarsi in rapporti sufficientemente stretti da dare origine ad un'effettiva interazione, si può allora sperare che possano seguire nuovi ed interessanti sviluppi.»

Designed by Santina Di Salvo

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On the cover: Barcelona, internal view of archaeological crypt of Plaça del Rei

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Methodological Approaches for the Enhancement of Cultural Heritage

Catalonia, park of Ciutadella de Roses (photo by Santina Di Salvo, 2010).

Index

Catalonia, park of Ciutadella de Roses: view of artificial lighting equipment (photo by Santina Di Salvo, 2010).

Presentation

WORTH AND *IDENTITY* OF THE CULTURAL HERITAGE

Olimpia Niglio

The preservation of Cultural Heritage, whether it is referred to the artistic, architectural, environmental, or more generally to the maintenance of every kind of knowledge developed in the past, pursues constructive goals when it allows every individual to freely manage their cultural interests and practoice their skills to develop their knowledge in accordance with the ethical values and design paradigms that characterize their own era. For this reason, the criteria adopted for the conservation of the architectural heritage of historical interest are affected by the nature of social problems and issues related to every human ecosystem of reference. There is therefore the problem of analyzing the bases of these references in different contexts which, in different countries, are moving criteria and establishing intervention strategies which are gradually consolidating. In the contribution of innovative technologies, these cultural references find a valuable contribution to value the assets properly and the volume of Santina Di Salvo has a series of very interesting examples which help us to reflect on concepts that are often considered abstract but fundamental to understand and contribute to the transmission of our past for future generations.

The concepts considered are those of worth, as enhancement, and identity that form the cornerstone of this brief introductory contribution. The concept of *worth* to which we must turn our attention certainly does not correspond to the familiar term *value*, linked to economic considerations. It must be remembered, however, that term in the context of more complex meanings corresponding to other theories including, for the purposes of the topics discussed here, those of anthropologist Marcel Mauss

and writer Jacques Godbout. These theories are structured on the concept of the *gift*[1]. The track of the events of the story is represented by heritage which every generation receives as a gift. It is a gift sent towards a transaction which is not conditioned by any specific rules based on the market economy. As a gift, the worth of an asset is therefore linked to the identity of the place of belonging. Therefore, it is not possible, as it is frequently found, a generalization of the concept of worth of an asset because the Cultural Heritage from which the concept refers is the result of experiences and choices developed in socio-cultural and economic factors always different. The concept of worth, as dependent on the identity of the place, takes on different connotations depending on its ability to express and especially to establish the links between Cultural Heritage and the society to which they belong.

Recognition of the worth establishes a close link between community and Cultural Heritage, and the identity of the place, as different molecules of the same universe. The knowledge of these identities is indeed favored by the many and varied activities that affect sensory and emotional aspects. Thus we can understand how the analysis of the worth of an asset received as a gift, even inherited, without a business transaction, is linked to the social and cultural context which the asset relates and, therefore, to the identity of the place. If you try to process the considerations presented here, in the field of Cultural Heritage and conservation, it is easy to see the complexity of the discussion. At the same time, there is the possibility to follow routes of reading that go beyond the barriers which we build ourselves at the expense of constructive dialogue between different cultures and respecting these differences[2].

In fact, the concepts of worth and identity lay the groundwork to open a constructive dialogue and exchange of experiences and diverse methodological approaches in relation to the principles relating to the conservation of Cultural Heritage and its transmission for future generations, as a gift. The awareness of this worth is capable to analyze, with greater objectivity, the dynamics that characterize the different theoretical and methodological approaches that can be found not only between different geographical areas, but also within the same country between diverse

socio-cultural contexts. Knowledge of diversity then becomes the primary and essential resource for the respect and preservation of the same diversity and the correct use of innovative technologies can provide valuable contributions in the pursuit of these important goals, mainly in terms of knowledge and therefore the worth of the heritage. The need to identify and expand on these concepts must be derived from an analysis that takes into account the complexity of the individual reality. In addressing this issue is critical to consider the real conflicts that have often allowed each community to guide their choices in the field of heritage conservation, and this volume offers us some very interesting insights.

Happy reading

Notes

1) O. Niglio, *Sul concetto di Valore per il patrimonio culturale*, in O. Niglio "Paisaje cultural urbano e identitad territorial", Atti del 2° Coloquio Red Internacional de pensamiento crítico sobre globalización y patrimonio construido (RIGPAC), Florencia 12-14 de julio de 2012. Vol. I, pp. 23-38; O. Niglio, Cultural Petition in the preservation project, VI International Conference "Paradigm shift in Heritage Protection. Tollerance for Change, Limits of Change, ICOMOS ISC Theory and Philosophy of Conservation and Restoration, Florence 4-6 march 2011. Volume published in Conservation Turn - Return to Conservation. Tolerance for Change, Limits of Change a cura di Simone Giometti, Wilfried Lipp, Bogusław Szmygin, Josef Štulc, Florence 2012, pp. 271-275.

2) *Convention on the protection and promotion of the diversity of cultural expressions* (Paris 2005), in O. Niglio, "Le Carte del Restauro. Documenti e Norme per la Conservazione dei Beni Architettonici ed Ambientali", Rome, 2012, pp. 198-214.

Catalonia, park of Ciutadella de Roses: view of artificial lighting equipment next to Medieval Monastery (photo by Santina Di Salvo, 2010).

Abstract

The subject of this essay starts by considering how, in many cases, artificial lighting outlines such as finding an "impalpable material" which helps to understand and enhance the ancient contexts. In general, it was demonstrated that, combining innovative technologies, light can be used to change the world, to shape cities, as well as architecture and space in general. Light can turn into concrete matter both in interiors, in archaeological and urban spaces. There is the possibility to obtain a recovery of memory and identity of a city, in order to achieve efficiency and effectiveness of the results. Starting with an overview of experimental research methodology it is possible to define and improve the built environment, either ancient and contemporary. Nowadays, we recognize the need for a renewed commitment to the questions posed by the contemporary city to imagine new constructability scenarios which pay attention to energy efficiency. Our century is characterized by uncertainty of a design approaches that lead different areas of the "buildable space", then the strategic role of technological innovation is that of changing this mental attitude, maintaining the world we live in.

***Keywords**: cultural heritage; identity; lighting; innovation*

Research aims

Archaeological sites, built landscapes of the past, represent the identity heritage for future generations. The aim of the essay is to investigate and demonstrate the importance of the cultural identity reinforcement, which is achieved by enhancing the historic heritage. The present study focuses on the technological invention and innovation, seen as an intellectual attitude that attempts to change the world in which we live. In fact, the research on the built environment of the past is an invaluable wealth of knowledge that can help you create new design concepts for the *constructability* of *the city of tomorrow*. Today, contemporary activities put into action in various ways, processes for reuse, awareness and

re-signification of places. The cultural aspect was overlooked in the 1990s: during these years, the focus was moved to transmission of meanings and the issue was how to convey historical data, artifacts, documents of past life. That's because today there is a greater interest than in the past, in knowledge of cultural heritage and the transmission of values to a non-specialist public[1].

Introduction

During the course of her research, the Author has investigated the use of artificial lighting as a *bulding material* for enhancing archaeological contexts. These tools are not different at all from any other available to every designer, architect or engineer: we refer to space, shapes, materials, colours, textures and, indeed, to light, both natural or artificial which is one of the most important design elements. In the fitting-out of archaeological ruins, this equipment serves to enhance the ruins themselves. Light serves primarily to show but also to reveal hidden meanings, to communicate functions or datings, to dramatize fragmented structures of ancient building and reconfigure them in a non-invasive method. It is not a new issue as is easily seen, but certainly an issue that, in its own right, should be the responsibility of anyone who is interested in the enhancement of archaeology that, - after an initial impulse, born in the wake of the view, not always valid and not always right, that the cultural heritage should have a strong economic impact on the territory - nowadays we are in a moment of explicit crisis, since many expectations have not yielded the expected results and there are objective economic difficulties facing the management of cultural heritage. These difficulties are much more pronounced, even aside from the serious crisis, when, as in Italy, people believe that archaeological sites should be fully borne by the government, when they believe that the basic decisions should be totally handled by a single controlling entity, the Superintendence; when they address the design choices from a conservative point of view, without considering other factors of interest, the community and economic actors who operate in it; when they have a confused perception of the public, without any assessment of the differences (local

community, scholars, students, tourists, children, old people, etc..); where actors (stakeholders) are scarcely involved and, finally, when the heritage to be protected and enhanced constitutes an unmanageable commitment, especially if it is not differentiated in its objectives. Lighting is an essential tool to transform the landscape of our city when the sun is down: it is well known that tourism is "night owl" and the nocturnal cityscapes are just as important as the daytime view, for example Italian archaeological sites, on which people see a mixture of interests (bathing, food, entertainment) and, therefore, the exploitation of our historical centres and archaeological sites happens at night. This change of attitudes has already been registered in archaeological sites in Catalonia, often limited by the presence of the tourist range of the Costa Brava, with the result that some sites were set up almost exclusively in anticipation of a night enjoyment.

Constructing the methodology

The joint approach of different disciplines is a methodological strength of all projects. In shared projects, a large number of transverse phases may well allow research teams to join in the development of common activities, useful to compare experiences and adopt the successful patterns of scientific knowledge. Experience has shown that innovation occurs when a process of change reaches a critical mass able to overcome the inertia of the "traditional system", and that it is only by insisting on new and innovative processes that you can think of: to develope a set of effective methods which could be relevant both locally and internationally; to enhance the responsibility of stakeholders involved; to reinforce the concept of participation on clear objectives; to establish groups of interdisciplinary research designed to implement plans much more ambitious than the current ones. In this scenario, you can read the signs of a possible different future, the feasibility of a new relationship between technology and the built landscape, the recovery of our forgotten humanism, obsessed by useless growth, the return to a true society in an economic framework of a balanced exchange. Through the results obtained from previous experimental projects, sometimes carried out, there

have been substantial changes in the way of seeing and living the landscape. The visitor isn't a spectator anymore, but he becomes a protagonist: the exploitation becomes active. The issues raised highlight the enormous responsibility and the potential space for technological innovation. Fields of social and cultural evolution will start technological as well as managerial innovation. Integrated demonstration projects, both urban and suburban, gave major contributions.

The built environment of the past, heritage for the future

Fascination of the past and the future

The premise reports on one aspect: we can not ignore, for open-air sites, the provision of a lighting designed with full awareness, without spectacular excesses but also without any techinical hesitation. For this purpose, you need to know and to practice the complex lighting which is now offered on the market, with technical expertise on performance and results, but, in contrast, since, as noted above, it is not just a matter of lighting, for more or less artistic purposes, but also of communicating, they also need a special museological sensitivity, acting in concert with all the assessments of opportunities and logistics to which we have referred, and providing new opportunities for efficient and effective collaboration with archaeological experts of the site. The discussion on the various tasks of artificial light in an archaeological context acquires a general feature that goes beyond the literature and provides a register of useful information to designers committed to pursuing strategies to consciously promote and enhance the built landscape.

Since early times, man has been fascinated by the past and, in a different way, by the future. Visiting ruins, every man meditates on his own destiny and on the destiny of his civilization, in an instinctive and dramatic way, but also in a quiet and sad way, activating a cognitive process which allows him to establish a *continuum* between past and future. In this relationship the main reason of the seduction of ruins stays: ruins evoke the contrast between the grandeur of when they were built and the unavoidable destiny of current decadence, the tension between the past and the future in our time, the contrast between what remains and what does-

n't exist anymore or is transformed. But ruins fascinate also because they were born by two different opposite elements: nature and culture. As life and death, creation and destruction, some antagonistic forces coexist giving life to a new formal unit, which contains within itself the stimulus to further creative processes. Consequently, archaeological sites, ruins and fragments are open spaces where what remains from history and the present time share a creative force, of which innovation is the key element. There is the necessity to bring the "intangible value" of the remnants of antiquity, through new design methods, to new meanings and new forms of modernity, establishing new relations between memory and innovation, between static and dynamic, between durability and instantaneity.
The archaeological sites are *sensitive areas* where it is necessary, before any intervention, to have a cross-disciplinary comparison among archeology, architecture, urban planning, geography, economics, museum design and technology, not only for knowledge, but also for conservation, enhancement and exploitation. This development stage marks the moment of the presentation to the audience of all that has been discovered. Therefore, enhancing the ruins, to enable contemporary man to enjoy a space which must be preserved and restored to the memory, is not only an architectural or conservative matter, or an issue of interest only to specialists of a particular domain, but also an innovative way to show events and cultural and social artifacts, involving all European society and all the communities belonging to it.

Uncertainty in project and the hope of the experimental research

As claimed by Marion King Hubbert, *During the last two centuries we have known nothing but exponential growth, and in parallel we have evolved what amounts to an exponential-growth culture, a culture so heavily dependent on the continuance of exponential growth for its stability that it is incapable of reckoning with the problems of non-growth. Since the problems confronting us are not intrinsically insoluble, it behooves us, while there is yet time, to begin a serious examination of the nature of our cultural constraints, and of the cultural adjustments nec-*

essary to permit us to deal effectively with the problems rapidly arising (Marion King Hubbert,1949).
The reflection of Hubert, highly topical, highlights how little has been recorded on our growth model in the last thirty years, and the need to start, with ambition and speed, structural changes in our economies and in urban cultures to face the current crisis. The city we live in, today is incapable of performing its functions of structure, it's not able to be a cultural guide anymore. The use of innovative technologies can be a test and a challenge for the re-construction of the rules to redevelop the built and "buildable" landscape, by inserting the ecological variable and the resulting technologies and manufacturing solutions.

Route Hypothesis - Interventions in Catalonia

The desire to return the historical reading of the city of the past to the community has meant that light in the archaeological sites in Catalonia was used to enable people to regain their identity and tourists to understand the story. In general, all visitors have the opportunity to enjoy the ruins of cities, not only with regard to education, but also for the aesthetic value added due to the the kinds of intervention implemented. Martirià Figueras, Catalan engineer, has specifically undertaken the lighting design on the site of Ciutadella de Roses, in Catalonia, (fig. 1), and explained how the light, seen as a communication tool, should highlight every single fragment, to return its cultural weight[2]. There is the intention to bring history to visitors, reconstructing, through light, the functions of buildings which have now disappeared. Artificial lighting must necessarily stimulate and maintain a constructive relationship with the ruins, making their reading easier using modern and innovative materials, to evoke the history and culture of a people in a particular place.

The Ciutadella de Roses

(Figg. 1/9) The Ciutadella de Roses in Catalonia is a monument that since 1961 has been part of Cultural Heritage of National Interest.
The interventions in the Ciutadella include a series of activities for in-

creasing the knowledge of history, ensuring the preservation and enjoyment of the archaeological sites. Therefore, it was important to explore new methodological guidelines in terms of organization and strategy, considering the development of new scientific projects proper to the aims of the interventions on the archaeological site. The setting and lighting design were realized by the company Aspecte, directed by Engineer Martyria Figueras. He has investigated the complexity and diversity of Roses, by launching an ambitious project, with the aim to allow residents and visitors a comprehensive perspective of the site. In the Ciutadella Museum, opened in 2004, different areas have been defined with the aim of revealing the history and different layers, presenting ruins and artifacts belonging to ancient civilizations:

a) Archaeological Area - preserved remains since 4th century BC until 20th century.
b) Public Area - The visitor can take advantage of wi-fi.
c) Exhibition Hall
d) Museum of History
e) Scenic Area - The town offers a unique view that can become the ideal scene of concerts.

Figueras has tried to encourage interaction between visitors and the place, trying to minimize the risks with reliable interventions. The creation of raised routes has made the passage of visitors to the archaeological area easier, limiting direct access to the ruins and preserving them. Walking inside the fortress is a continuous discovery because it offers the possibility of enjoying magnificent views, both inside and outside the fence. Figueras has explained how the luminous sign can highlight the single fragment restoring cultural weight. Artificial lighting must necessarily seek a constructive relationship with the ruins, while facilitating their reading with an innovative use of a modern material. The lighting design gives the opportunity to reveal the history of the city of Roses following a route that focuses on six sections: the origins, the area of Greek settlements, the area of Roman settlements, the Monastery, the medieval town and the modern city. LED lighting fixtures were used,

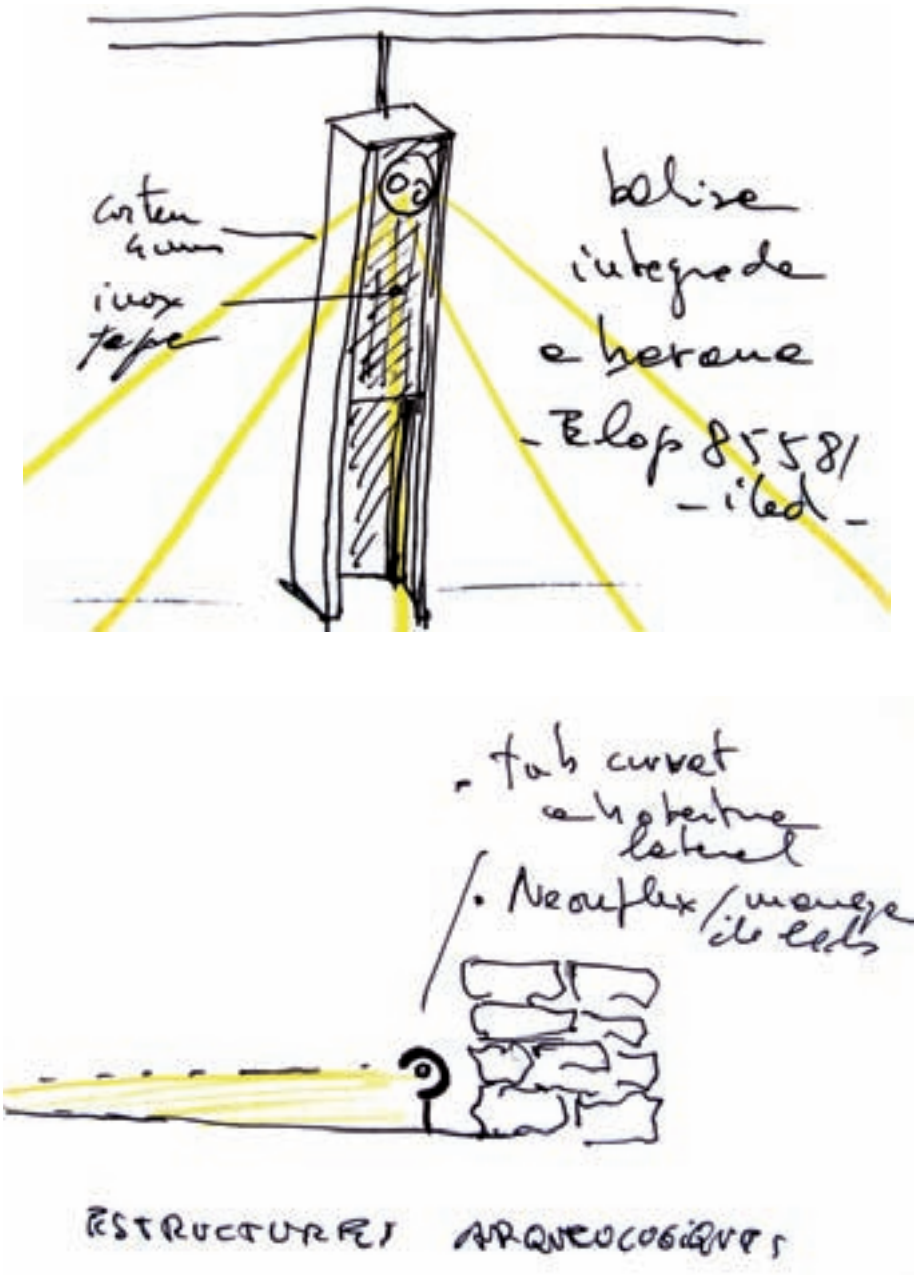
Figures 1-2: Ciutadella de Roses, Roman and Greek settlements (© Aspecte).

Figures 3-4: Ciutadella de Roses, illuminated routes (© Aspecte).

Figures 5-6: Ciutadella de Roses, spectacular effects on Medieval Monastery (© Di Salvo).

Figures 7-8: Ciutadella de Roses, LED rgb lighting on ancient ruins (© Aspecte).

Figures 9-10: Ciutadella de Roses, play of light on the ruins (© Aspecte).



Figures 11-12: sketches of the lighting systems used on archaeological ruins (© Aspecte).

special shapes, placed at strategic points, so as not to disturb visitors with contrasts of light and make the environments recognizable. The LED light, being cold light, doesn't emit emissions which are harmful to the ruins and allows recognition of the remains of settlements, creating atmosphere through different colours, making emotional impressions on the visitors who are fascinated and enchanted. Materials capable of capturing the attention of the visitor were used, and at the same time capable of describing the periods, functions or activities of the ruins in the past, without any damage. This goal was achieved through strategies in which the characteristics of different materials, different colours and other elements of communication were evaluated. Martyria Figueras says that *the landscape of Roses includes various landscapes in an unique landscape*.

Light highlights the most significant evidence of the historical layers: Crypt of Placa del Rei

(Figg. 13-18) - Starting from an archaeological fragment, through the use of light is possible to recall periods, historical layers, locations and

Figure 13: Barcelona, archaeological crypt of Placa del Rei. Section with the view on illuminated roman ruins.

Figures 14-15: Placa del Rei, general routes and view on ancient Roman remnants.

Figure 16: Placa del Rei, general view of archaeological crypt. Few materials have been used: steel, for the structure resting on the ancient stones and for dark parapets; wooden slats for the floor; black plaster for the roof.

Figures 17-18: Placa del Rei, remnants of Roman baths.

functions sedimented in the collective imagination. If it is true that we should know and practice all kinds of possibilities offered by contemporary lighting market with a precise knowledge of their performance and results, we are aware that not only it is important to make light, but it is also very important to communicate history. In the Crypt of Plaça del Rei in Barcelona, architect Josep Llinas doesn't manipulate the archaeological remains, which remain intangible. He mediates their understanding through games of brightness, contrasts and colour variations. In particular, the areas of pedestrian movement lie in the shadow, while warm or cold colours illuminate the archaeological artifacts, highlighting the most significant finds of the ancient Barcino. Few materials have been used: steel, for the structure resting on the ancient stones and for dark parapets; wooden slats for the floor; black plaster for the roof.

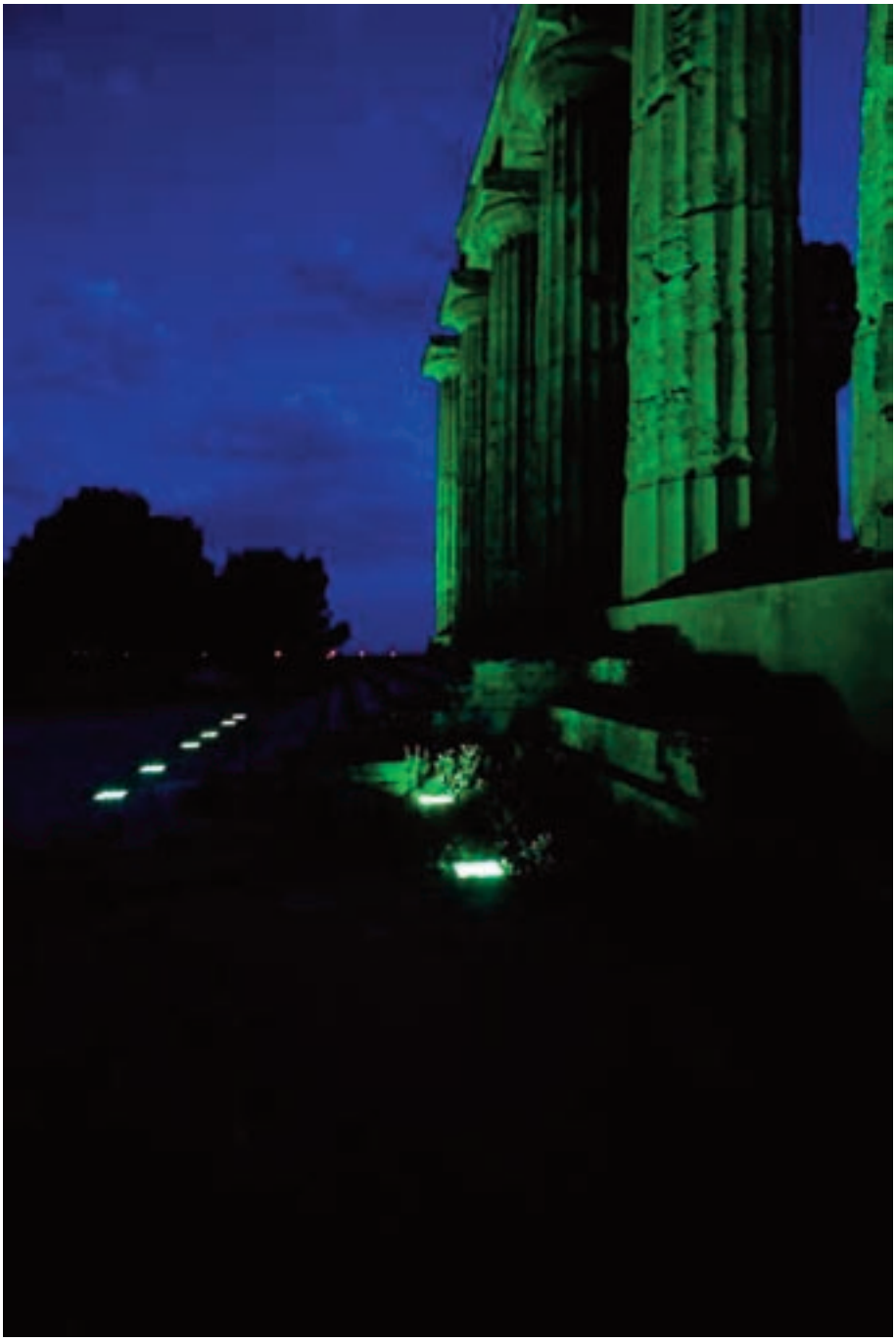
Light can emphasize the landscape, also with spectacular effects: Sicily, Selinunte

The Archaeological Park of Selinunte was established in 1993, and today it's the largest and most impressive in Europe. The ruins of the colossal Temples show that since its foundation Selinunte has been considered "the cradle of the Doric-style". This privileged destination for poets and travelers, has always seemed like a huge expanse of ruins. We realize it by viewing pictures and description of the 18th century (such as those of Hackert and Houel). Temple E (fig. 19), in particular, is the greater attraction of the archaeological park. Since 2008 an experimental intervention of lighting has highlighted this monument. This project was commissioned by the Province of Trapani.
The lighting design was marked by the idea to convey to visitors the magnificence of the original structure, trying to recall his former beauty. Flush mounting lamps were located around the Temple: LED projectors distribute the light evenly to the entablature: the effect is without any doubt spectacular because there are changes in colour due to the dynamic light. High levels of illumination are achieved without any risk to the structural integrity of the stones of the monument, there is no ultraviolet or infrared radiation (with reduced pollution and energy savings). If this

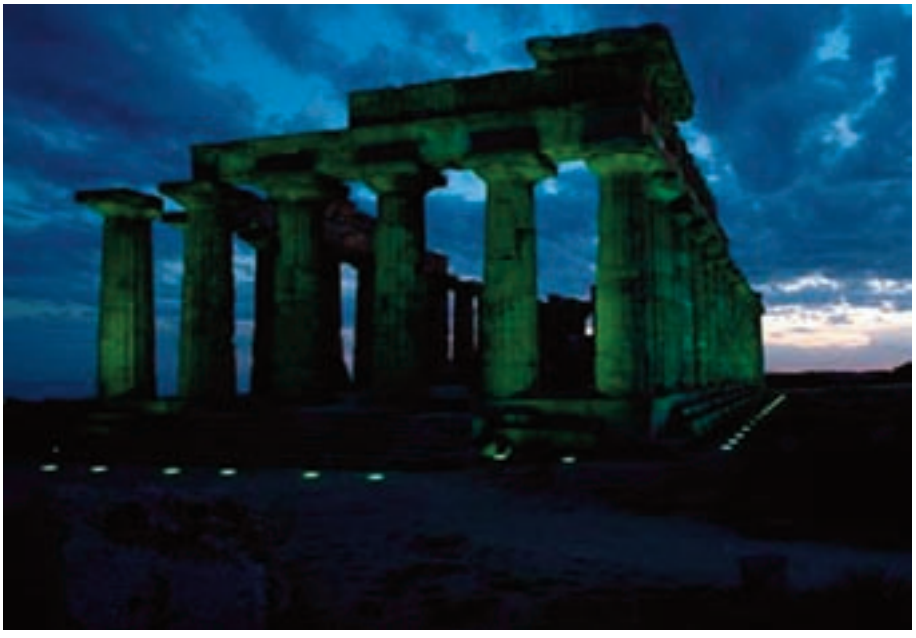
kind of intervention has benefits in terms of technological features, it represents a case of bad practice in terms of the didacticcommunicative purpose: the choice of colours doesn't have any conceptual connection with the archaeological site, with the history, but it's a pure spectacular entertainment. You cannot perceive the spiritual and symbolic meaning of the Temple. The final result is a real distraction from the monument itself and the landscape, Finally, the intervention leads to a misperception of the cultural content of the monument. In addition, we consider these aspects:
1) Drastic frontal lighting on each column reduces the contrasts necessary to the perception of fluting and of the others part of the monument like the inside, as well (figg. 20-23).
2) The uniform illumination on all fronts prevents perception of the sense of threedimensionality of the Temple (figg. 24-30).
3) The lack of lighting inside, prevents the perception of the deep sense of the Temple. Spectacular effects go beyond the idea of communicating the proper historical and symbolic value.
4) In terms of visual impact both day and night the installations are visible on the ground. The final result is a real distraction from the monument itself, as well as from the background, which is the landscape, Finally, the intervention leads to a misperception of the cultural content of the monument. In fact, the dynamic light could have to identify the three phases of construction of the Temple, but his goal has not been achieved.

Figure 19: Sicily, archaeological park of Selinunte. View of the path and the Temple of Hera.

Figures 20-21-22: Sicily, archaeological park of Selinunte. General view of the path and the Temple of Hera, especially on the underground lighting systems



Figures 23-24-25: Sicily, archaeological park of Selinunte. Experimental dynamic lighting on the Temple of Hera, with spectacular effects (LED rgb).



Figures 26-27: Sicily, archaeological park of Selinunte. Experimental lighting on the Temple of Hera, with spectacular effects.

Figures 28-29: internal view of the Temple of Hera.

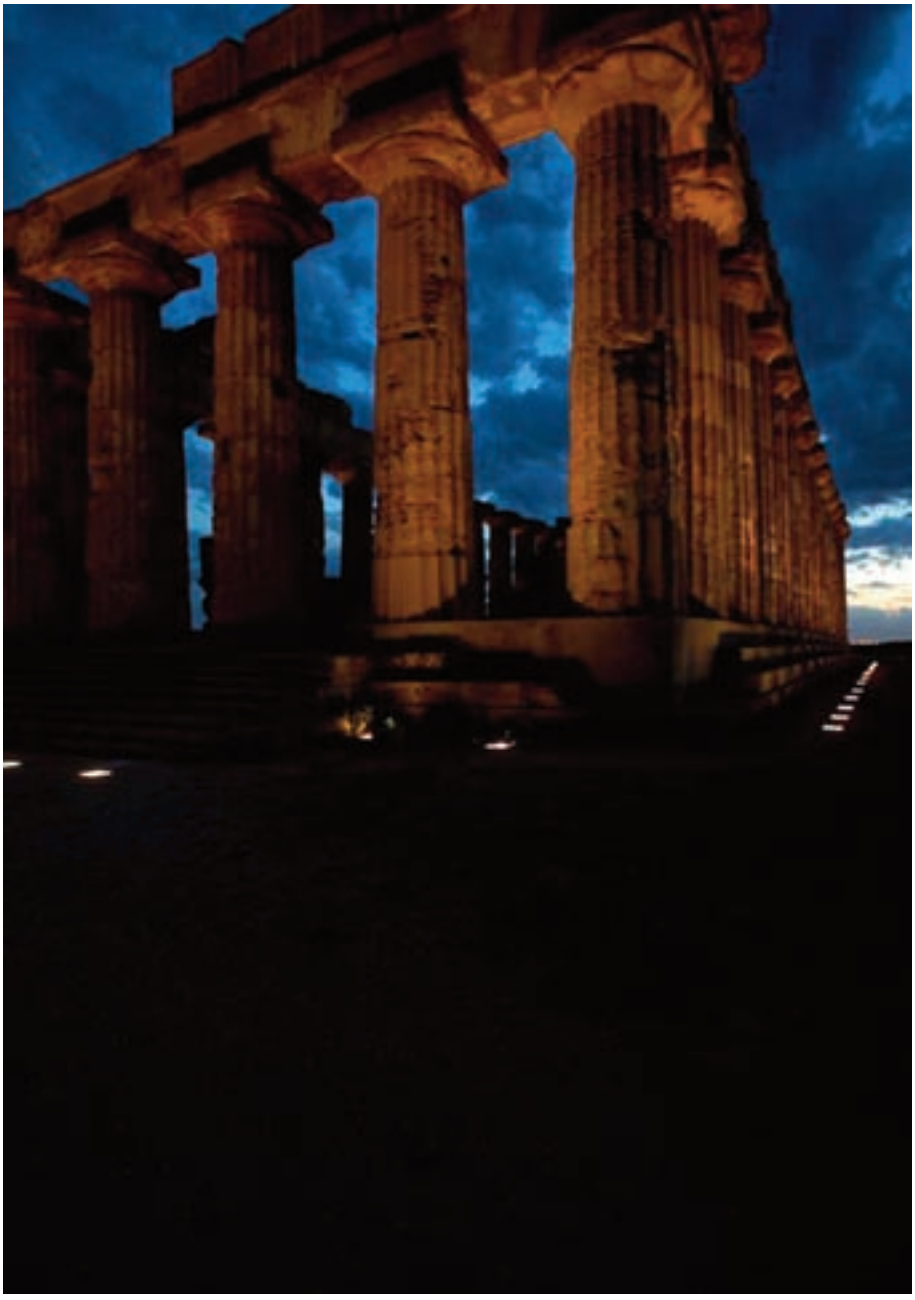


Figure 30: external view of the Temple of Hera.

Results
Reliability of the methodology

As a result of these investigations and studies gained from direct experience, we have detected the existence of some possible risks inherent in the decision of the designer to use innovative technologies. Despite the technical quality of many of the projects, critically studied by the author, some recurring problems arise, somehow questioning the initial hypothesis of our investigation, that artificial light, as an innovative *medium*, considering systems and sources, is an important resource to recover the built environment, identity heritage for future generations. In fact:
In some operations, with particular regard to the lighting project, technology has made some interventions too exuberant, not always up to expectations: often, instances of innovation do not coincide with the achievement of a process of re-signification and improvement of the built environment. In fact, there are cases of interventions not adequate in parts where the design quality should be treated, as the definition of a balanced connection between architectural parts, environment and efficiency of tools and methods used. Today visitors and the community, often see in ancient contexts the use of technologies too connected to the desire of being surprised, of getting a grip on emotion and suggestion. Often, architecture approaches fashion, and presents more its image that its function, the container is described more than the product, the box more than the content. We believe, therefore, in the need of considering the following important issues, which may constitute essential guidelines, for establishing criteria to improve the built landscape:

1 - *Specificity* - The architect technologist must be able to understand the peculiarities of each case, in the place where he is going to design, considering the specific historical and geographical context.

2 - *Cognitive process and uncertainty of the project* - We must remember that, in particular, the field of archaeological heritage is a complex area because the matter is submerged, unpredictable and quality and quantity

varies. To be able to proceed with an application of innovative technologies having positive outcomes, we must have awareness that the project takes shape very often during the execution of works and can take on connotations different from those projected at the beginning. Therefore, each path of development comes from a cognitive process, understood as a sequence of moments, as a succession of ever-changing facts.

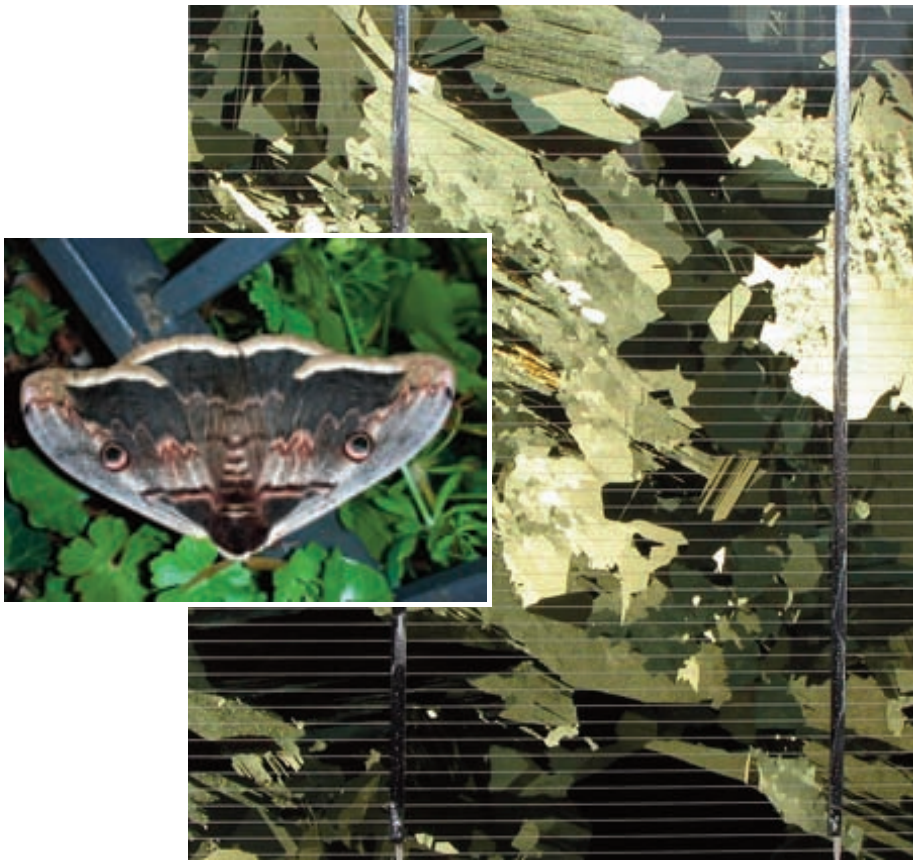
3 - *Reliability of interventions* - The existence of the space-time factor is an essential datum in every process definition and enhancement of the built environment, where the basic prerequisite for the reliability of interventions is the flexibility of the project which can be reached through a cognitive process, understood as a succession of events in continuous transformation. Furthermore, through the creation of research teams made up of professionals of different disciplines, issues related to conservation and restoration of archaeological remains can be undertaken, but also those related to technological aspects, always strongly considesidsring the following important requirements, aiming to protect the *buildable*: flexibility, a semantic thinness more accentuated than the preexistence, reversibility, distinctness, ease of maintenance, energy efficiency and minimal environmental impact.

ANNEX
Innovative experiments in progress

This discussion leaves open the following issues:
1) The evaluation of effective strategies to develop, based on good practices and policies applicable to the built environment - Experimental research can become an opportunity to spread information and raise awareness in all actors involved, public and private, of the richness of our precious built heritage, by updating the current cognitive map, extrapolating the appearance of historic buildings in the absence of actual physical remains and make it capable of dealing with innovation. Thorough investigations may trigger new studies on the evaluation of characteristics, opportunities and effects of re-involvement of technology in knowledge, appreciation and communication of the built heritage, both

ancient and modern. Scientific experiences of the author, shown by scientific and technological patents, regarding the implementation projects on Nanomaterials, nanostructured inorganic oxides, and more particularly titanium sesquioxide (Ti2O3) and silicon (Si2O3), have shown that it is possible to obtain materials with high level of biocompatibility that can be used for the consolidation of archaeological wood and stones.
This invention, entitled *Innovative sonochemical process that employs ultrasonic cavitation for the synthesis of monodispersed amorphous silicon dioxide nanoparticles, and method for producing high-performance water-soluble lithium silicate compounds, for the application in the consolidation in situ of ancient stone and wood structures*, represents a powerful breakthrough in the synthesis of new materials for the protection of buildings, therefore for the improvement of the *built environment*[3]. The self-cleaning ability of this new type of silicon oxide, having a nanoscale structure, applied directly on the stone surfaces, allows us to preserve their condition unchanged, without any alterations to their appearance of technical features, preventing a biological pollutants and corrosion impurities, effectively counteracting the deterioration of the surfaces of stone materials and significantly reduces maintenance costs.
2) Research on innovative systems for the protection of the *buildable environment*, with particular attention to the study of materials and energy efficiency. Another invention of the author, entitled *Etching liquid composition, aimed at creating an anti-reflective fractal structure on the surface of photovoltaic cells, composed of a wafer of semiconductor material silicon; and method for making said fractal structure*, aimed at further improving the energy efficiency of photovoltaic systems[4]. This patent comes from the analysis of state of the art of the experiments carried out in Japan on photovoltaic cells with conversion efficiency of sunlight to electricity up to 6% higher than the existing cells. These cells have been developed by a group of Japanese scientists that have come up with a nanotechnology antireflection coating inspired by the eyes of moths (figg. 31-32). The Japanese researchers of Nagaoka University of Technology, Niigata, understood that this structure was the key to reducing light scattering and, therefore, to absorbing a larger amount.

Next-generation cell protection film made exactly like the eye microstructure of the moth to the thin-film technology cutting down on the amount of light reflected by the solar cell, allowing the cell to get more of the sun's energy. "Surface reflections are an essential loss for any type of photovoltaic module, and ultimately low reflections are desired," said Noboru Yamada of Nagaoka University of Technology. Yamada shared "moth eye" films improved the efficiency of solar cells two testing regions Phoenix and Tokyo by around 6% and 5%.



Figg. 31-32: Studies on antireflection coating of photovoltaic cells inspired by the eyes of moths.

Conclusions

Cultural heritage is the mirror of society. It constitutes the legacy of tangible artefacts, such as historical buildings and monuments, as well as intangible features, such as traditions, customs and practices. Tangible and intangible cultural heritage operate through a symbiotic relationship, whereby the physical symbols serve as evidence of underlying norms and values of a culture. Taking this into consideration, the importance of protecting tangible cultural heritage is significant not only in order to reflect on and to better understand the past but also to maintain identification in the future.
The cultural heritage of the European Union is crucial for establishing a shared European identification through progressive integration. To add to this challenge, there have been no prior means to disseminate research results which applies to the protection of tangible cultural heritage.

All the projects, the above patents show the commitment and interest in the experimental research in innovative technologies and reliable systems to ensure the preservation, enhancement, exploitation and enjoyment of the built landscape and an intelligent use of *constructable space*. In this historical moment marked by the use of high technology, the continual technological research may be the starting point for further renewed reflexion on the concepts of preservation, enhancement and innovation. We're talking about technologies that can be successfully tested on their, to bring history to life, to protect our build environment of the past, setting the stage for a really accessible and safeguarded city of the future.

Notes

1. A consequence of the attitude reflective was to extend, first, the themes of enlightenment of archeology to ruins preserved indoors. For example, a case now widespread throughout Europe concerns the so-called archaeological crypts, inside of which the artificial light, variously

colored and manipulated through the use of interactive consoles, has become one of the essential means of communication to a different audiences.

2. The Aspecte is a company based in Banyoles, founded on the 2 April 1991. Currently directed by theengineer Martirià Figueras, it has a multidisciplinary team of technical professionals, experts in the design and management of green spaces. The company specializes in the field of landscape and it's evolving with the creation of new departments specialized in new design approaches and landscape enhancement.

3. S. Di Salvo is the applicant of the Patent titled *Innovative sonochemical process that employs ultrasonic cavitation for the synthesis of monodispersed amorphous silicon dioxide nanoparticles, and method for producing high-performance water-soluble lithium silicate compounds, for the application in the consolidation in situ of ancient stone and wood structures.* Patent Pending nr. PA2011A000012, (30 August 2011).

4. S. Di Salvo is the applicant of Patent titled *Etching liquid composition, aimed at creating an anti-reflective fractal structure on the surface of photovoltaic cells, composed of a wafer of semiconductor material silicon; and method for making said fractal structure.* Patent pending nr. PA2012A000012 (12 June 2012).

Photographic references

Santina Di Salvo
Figures: 5 - 6 - 14 - 19 - 20 - 21 - 22 - 26

Aspecte - Martirià Figueras
Figures: 1 - 2 - 3 - 4 - 7 - 8 - 9 - 10 - 11 - 12

Azienda Disano
Figures: 23 - 24 - 25 - 27 - 28 - 29 - 30

Various authors
Figures: 13 - 15 - 16 - 17 - 18 - 31 - 32

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