PRESENTATION OF CLASSICAL ARCHAEOLOGICAL SITES
IN VIRTUAL ENVIRONMENT
CASE STUDY: SAGALASSOS

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ÖZGE BAŞAĞAÇ

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Approval of the Graduate School of Natural and Applied Sciences

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Prof. Dr. Canan Özgen
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.

_____

Assoc. Prof. Dr. Selahattin Önür
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

_____

Dr. Fuat Gökçe
Supervisor

Examining Committee Members

Assc. Prof. Dr. Emre Madran   (METU,ARCH)   _____

Dr. Fuat Gökçe   (METU, ARCH)   _____

Asst. Prof. Dr. Güliz B. Altınöz   (METU, ARCH)   _____

Dr. Nimet Özgönül   (METU, ARCH)   _____

Dr. Musa Kadıoğlu   (AÜ, DTCF)   _____

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Name, **Surname**: Özge Başağaç

Signature:

ABSTRACT

PRESENTATION OF CLASSICAL ARCHAEOLOGICAL SITES
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BAŞAĞAÇ, Özge

M.S, Department of Architecture in Restoration

Supervisor: Dr. Fuat GÖKÇE

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Parallel to the growing concern for the protection and presentation of archaeological sites, virtual environments (VE) are in use for visualization purposes since mid 1980's. This thesis investigates the potentials and problems of presenting a classical archaeological site in VE from the viewpoint of conservation science, to ensure the welfare of the remains. The study is handled in two sections as a conceptual part and a case study. The conceptual part, first dwells upon the history, aim and techniques of the VE presentations. This section ends with the development of criteria for the evaluation of VE presentations of classical archaeological sites. For the case study, the antique city of Sagalassos is investigated through its history, urban tissue, architecture, multidisciplinary studies and VE projects. The thesis concludes with general remarks on the presentation of classical archaeological sites in VE and proposes some solutions to improve the presentation of Sagalassos in particular.

ÖZ

KLASİK ARKEOLOJİK ALANLARIN SANAL ÇEVREDE SUNUMU ÖRNEKLEME ÇALIŞMASI: SAGALASSOS

BAŞAĞAÇ, Özge

Yüksek Lisans, Mimarlık Bölümü, Restorasyon ABD

Tez Yöneticisi: Dr. Fuat GÖKÇE

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Arkeolojik alanların korunması ve sunulması yönünde artan kaygılara koşut olarak, 1980'lerin ortalarından bu yana görselleştirme amacıyla sanal çevre kullanılmaktadır. Bu tez, kalıntıların korunması için, klasik bir arkeolojik alanın sanal çevrede sunulmasının potansiyellerini ve problemlerini araştırmaktadır. Tez, kavramsal bölüm ve örnekleme çalışması olarak iki parçada ele alınmıştır. Kavramsal kısım önce sanal çevrede yapılan sunumların tarihçesini, amacını ve teknolojisini incelemektedir. Bu bölümün sonunda klasik arkeolojik alanların sanal çevrede sunulması için gerekli kriterler geliştirilmiştir. Örnekleme çalışması için, antik Sagalassos kentinin tarihi, kentsel dokusu, mimarisi, çeşitli disiplinlerdeki çalışmalar ve sanal çevredeki projeleri araştırılmıştır. Tez klasik arkeolojik alanların sanal çevrede sunumu üzerine genel öneriler ve Sagalassos özelindeki sunumun geliştirilmesi için çözümlerle sonlanmaktadır.

Anahtar Kelimeler: Sunum, Arkeolojik Alan, Sanal Çevre, Sagalassos, Koruma.

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I would like to thank to the other members of the examining committee who have kindly accepted to examine the thesis.

I express my appreciation to all of my friends, who have always helped me even over the miles. We are the corners of a single stone.

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CHAPTER 1

INTRODUCTION

1.1 Aim and Scope

Archaeological sites form an integral part of the cultural heritage. Within the conservation process of any cultural heritage site, the interpretation of the meanings of the site is essential as much as the protection of the extant remains.[1] Because interpretation evokes public understanding of the cultural heritage and increases public appreciation for the need of its conservation.[2] This aspect is especially important for archaeological heritage since ancient sites rarely form a part of our daily practice and stay alien to non-professionals as opposed to the other types of cultural heritage.

An archaeological site embraces not only its physical remains but also the human context and local archaeological conditions in which it was created, built or inhabited.[3] Thus a significant characteristic of an archaeological site is authenticity, both the genuine state and the final state of a historical resource as it has aged in time.[4] Authenticity may be linked to

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[1] "Icomos Ename Charter For the Interpretation of Cultural Heritage Sites, Second Draft, 24 June 2004", Icomos, http://www.icomos.org/icahm/enamecharter.pdf, accessed on 08 January 2005. Within the charter interpretation is defined as "the carefully planned public explanation or discussion of a cultural heritage site, encompassing its full significance, multiple meanings and values".

[2] Icomos Ename Charter, ibid.

[3] "Proposal for the Ename Charter- Draft 2 (17 October 2002)", 2002, Belgium, http://www.heritage.umd.edu/CHRSWeb/Belgium/Proposed%20Charter.htm, accessed on 27 February 2005.

[4] Feilden, B. M. & Jokilehto, J., 1993, *Management Guidelines for World Cultural Heritage Sites,* Iccrom, p. 16.

different aspects like form, design, materials, use, function, traditions, techniques, setting, spirit, feeling, and other information sources.[5]

Another important characteristic is the intrinsic values:[6]

All objects (including edifices) in archaeological sites can be considered as historical documents of the period starting from the moment they existed until now, thus they gain a documentation value.

Age value stands for the oldness and life-span. It originates from the historical stratification of the objects themselves.

The use values of classical period archaeological sites are limited. Apart from very exceptional cases they can not be refunctioned. But they can be mainly utilized for didactic purposes. This raises the education value.

Economic value has four sources of income: tourism, commerce, use and amenities.[7] But, instead of merely making profit from the cultural resource this value aims to be a financial support to it, to other archaeological sites or even to nearby contemporary settlements.

Since early 20th century, there have been several attempts to maintain the quality of the conservation and restoration of the physical structure of archaeological sites along with their authenticity and values.[8]

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[5] Madran, E. & Özgönül, N. (eds), 1999, "Document of Nara", *International Documents Regarding the Preservation of Cultural and Natural Heritage,* METU Faculty of Architecture Press, Ankara, p. 504.

[6] Values of cultural heritage sites may be numerous. However, these are the most discussed and accepted ones of archaeological sites. For a discussion on different types of values see Frodl, W., 1966, "Anıtlar, Bakım ve Onarımları", *Akademi*, Volume 5, pp. 4-14; Hueber, F., 1991, "Arkeolojik Yapıların ve Alanların Koruma ve Restorasyon Sorunları", *Arkeolojik Sit Alanlarının Korunması ve Değerlendirilmesi I. Ulusal Sempozyumu 14-16 Ekim 1991*, TC Kültür Bakanlığı, pp. 37-42; Riegl, A., 1982, "The Modern Cult of Monuments: Its Character and Its Origin", *Oppositions*, translated by K. W. Forster and D. Ghirardo, Volume 25, pp. 21-51; Lipe, W. D., 1984, "Value and Meaning in Cultural Resources", *Approaches to the Archaeological Heritage*, ed. H. Cleere, Cambridge University Press, Cambridge, pp. 1-11; Feilden, B. M. & Jokilehto, J., 1993, *Management Guidelines for World Cultural Heritage Sites,* Iccrom, Rome.

[7] Feilden, B. M. & Jokilehto, J., ibid, p. 19.

[8] Archaeological sites are mentioned in only one article of the following international documents, Erder, C., 1975, "Atina Konferansı 21-30 Ekim 1931", *Tarihi Çevre Bilinci,* METU

Physical treatments, on different scales from consolidation to reconstruction, also have formed a part of these attempts.[9] But these interventions have been capable of enhancing the values and authenticity of the sites or totally damaging these intrinsic characteristics.

On the other hand, there has been no "generalised international oversight of the methods and standards of quality in public presentation" until 2002 Ename Charter.[10]

The presentation of archaeological sites has always been, and still is, a problem as the excavated remains are often in ruins and meaningless, if

Faculty of Architecture Press, Ankara, p. 280; Erder, C., "Carta del Restauro, 1931", ibid, p. 284; Madran, E. & Özgönül, N. (eds), 1999, "Venice Charter, The International Charter for The Conservation And Restoration Of Monuments and Sites, 31 May 1964, Venice", *International Documents Regarding the Preservation of Cultural and Natural Heritage,* METU Faculty of Architecture Press, Ankara, pp. 31- 4. In 1956 UNESCO provides guidance for the execution of archaeological excavations, Madran, E. & Özgönül, N. (eds), 1999, "Recommendation on International Principles Applicable to Archaeological Excavations, New Delhi, 5 December 1956, UNESCO", ibid, pp. 18- 24. The first effective attempt to protect this heritage comes in 1969, Madran, E. & Özgönül, N. (eds), 1999, "European Convention on the Protection of the Archaeological Heritage, London, 6 May 1969, Council of Europe", ibid, pp. 81-4. A working group for archaeological remains through urban planning is set up within the Council of Europe in 1982, *A Future for Our Past,* 1982, No.19, Council of Europe, pp. 14- 5. The International Committee on Archaeological Heritage Management is established in 1990, http://www.icomos.org/icahm/, accessed on 15 February 2005. Turkey arranges its first national meeting on the protection of the archaeological heritage in 1991, *Arkeolojik Sit Alanlarının Korunması Ve Değerlendirilmesi 1. Ulusal Sempozyumu 14-16 Ekim 1991, Antalya,* 1991, Kültür ve Tabiat Varlıklarını Koruma Genel Müdürlüğü, Ankara.

[9] For the discussions on the different types of treatments see Feilden, B. M. & Jokilehto, J., 1993, *Management Guidelines for World Cultural Heritage Sites,* Iccrom, Rome; Mertens, D., 1995, "Planning and Executing Anastylosis of Stone Buildings", *Conservation On Archaeological Excavations,* ed. N. P. Stanley Price, Rome, pp. 113-34; Hueber, F., 1991, "Arkeolojik Yapıların ve Alanların Koruma ve Restorasyon Sorunları" , *Arkeolojik Sit Alanlarının Korunması ve Değerlendirilmesi I. Ulusal Sempozyumu 14-16 Ekim 1991*, TC Kültür Bakanlığı, pp. 37-42; Madran, E. & Özgönül, N. (eds), 1999, "Venice Charter, The International Charter For The Conservation And Restoration Of Monuments And Sites, 31 May 1964, Venice", *International Documents Regarding the Preservation of Cultural and Natural Heritage,* METU Faculty of Architecture Press, Ankara, pp. 31-4.

[10] "Proposal for the Ename Charter- Draft 2 (17 October 2002)", 2002, Belgium, http://www.heritage.umd.edu/CHRSWeb/Belgium/Proposed%20Charter.htm, accessed on 27 February 2005.

not invisible, to the non-specialists.[11] Since 19th century various methods like engravings, photography, reconstructions, didactic restorations, shelters, signs, information panels, graphic reconstructions, models, human guides, costumed interpreters... have been utilized for the presentation of archaeological sites, each with its peculiar negative and positive impacts.[12] "The more extensive the intervention, the more we impose our image of the past on a site and condition future interpretations of it."[13] Thus, a non-intrusive but easily updatable method had been needed for presentation purposes. Since 1980's Virtual Environment (VE) has been providing this medium as an alternative or extension to physical interventions.[14] Moreover, off site presentations are highly possible by VE, through the popular world of Internet, too.

In such a short period, numerous studies have been realized and many more are being carried out on the presentation of archaeological sites in VE. It is necessary to evaluate the results of these efforts to understand their contribution both in negative and positive terms. Systematic assessment of those experiences may enhance the utilization of VE in archaeological sites and shed light on future projects in the same field.

Regarding the background outlined above, this study aims at dealing with the presentation issue of archaeological heritage, particularly for the broader audience, by investigating the potentials and problems of VE for a classical archaeological site.

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[11] Price, N. P. S., 1990, "Conservation and information in the display of prehistoric sites", *The Politics of the Past*, Unwin Hyman, London, p. 284.

[12] See Sections 2.1 and 2.2 for a detailed discussion on the development and effects of presentation methods including VE.

[13] Price, N. P. S., ibid, p. 287.

[14] The applications in VE evolve parallel to the development of personal computers. See Section 2.1 and 2.2 for a detailed discussion.

The thesis focuses on classical archaeological sites[15] because classical architecture had been studied extensively since the beginning of enlightment. Its inherent logic and order have enabled people to understand its form, thus visualize its original appearance, although comparatively little of the original building survived.[16] Consequently, such sites have often been the subject of presentation studies among the archaeological heritage either in reality or in other mediums like on paper or in virtual environment. There are several similar sites in Turkey which are subjected to or in need of presentation interventions, too.[17] Moreover, the author's experience of archaeology is mainly constructed by her work in classical sites. This fact provides a lot of material for comparison and at the same time presents an opportunity to make a small contribution to the presentation process.

As a case study, the ancient city of Sagalassos in Pisidia, now within the borders of Burdur Province, is chosen. Though it can be considered as a "new" excavation when compared to the others like Ephesus or Pergamon[18], Sagalassos is still one of the projects which presents various types of interventions at different scales. Moreover, Sagalassos is part of a European consortium developing 3D visualizations for the site.[19] This consortium not

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[15] "Classical archaeology is a term given to archaeological investigation of the Mediterranean civilizations of Ancient Greece and Rome", quoted from http://en.wikipedia.org/wiki/Classical_archaeology, accessed on 01 March 2005.

[16] Mertens, D., 1995, *Conservation On Archaeological Excavations,* "Planning and Executing Anastylosis of Stone Buildings", ed. N. P. Stanley Price, Rome, p. 115.

[17] This fact is derived mainly from the investigations in the "Proceedings of the International Excavation, Research and Archaeometry Symposiums" and direct personal observations on sites.

[18] Ephesos excavations started in 1896, http://www.perseus.tufts.edu/cgi-bin/siteindex?entry=Ephesos, accessed on 09 February 2005; Pergamon excavations started in 1878, Radt, W., 2002, *Pergamon*, YKY, İstanbul, p. 11 and Sagalassos excavations started in 1990, http://www.sagalassos.be, accessed on 09 February 2005.

[19] For 3D Murale Project (3D Measurement and Virtual Reconstruction of Ancient Lost Worlds of Europe) see http://www.brunel.ac.uk/project/murale/home.html. The project has

only tries to reconstruct the edifices in VE but also the excavation process for research purposes. Thus, the virtual presentation of Sagalassos is targeted at the scholars and visitors at different levels. And finally, the author of this thesis has been working in Sagalassos for five years and her modest experience provides an advantage in investigating this archaeological site.

1.2 Methodology and Constraints

The thesis is composed of a conceptual part and a case study focusing on the archaeological site of Sagalassos.

A detailed literature survey for an overview of VE presentations including their history, aim and scope, techniques and problems constitute the structure of the conceptual part of the thesis. This part is utilized to provide a background for assessing the VE presentations of classical archaeological sites, particularly for the broader audience.

To evaluate the VE presentations for the non-professional audience several criterias are defined by the author after the discussions within the thesis. Three general aims are regarded from conservation point of view:

A. The presentation should have a didactic character;

1. It should be suitable for the chosen target audience.

2. It should help to enhance the experiencing of the archaeological heritage. "Reality" should be conveyed by a scientifically valid presentation. The abstraction should not be taken too far.

3. It should reflect the hierarchy of knowledge about the archaeological heritage (what is original and what is hypothetical?) not to mislead the audience. The abstraction process should be transparent.

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been completed last year and evolved into a bigger project named EPOCH (A European Research Network on Excellence in Processing Open Cultural Heritage) at http://www.epoch-net.org (accessed on 28 December 2004).

4. It should reinforce the appreciation of the intrinsic values (documentary, age, education, economic...) of the archaeological heritage.

5. It should reflect the authenticity of the archaeological heritage:

> * It should include different dimensions of authenticity like form and design, materials and substance, use and function, traditions and techniques.

> * It should provide other dimensions of authenticity like location and setting (architectural and natural context), spirit and feeling (spiritual context), social context and other contexts.

> * It should be multi-temporal and reflect historical evolution or stratigraphy.

6. It should be flexible in terms of providing alternative stories/ proposals to different user groups. The presentation should be tolerant to updating as a result of different scholarly perspectives or modified knowledge.

7. Alternatives should also be valid for the choice of presentation language. If the archaeological site has/ aims to have a certain amount of international visitors, the presentation should be multilingual.

8. To increase the level of learning, the presentation should be interactive and user-friendly.

9. Regardless of the dissemination medium (on site, through internet, on CD Roms, DVDs...), VE should be a part of the presentation process, complementary to physical on site interventions.

B. The VE presentation should create a conservation conciousness.

C. The presentation should try to be an alternative to physical reconstructions thus protect the authenticity of the archaeological heritage.

The case study part about Sagalassos is mainly constructed by literature survey. *Acta Archaeologica Series* on Sagalassos present the excavation reports, results and all the interdisciplinary studies. Direct on site investigations (which also produces photographic evidence) and interviews with the staff of the archaeological research project through five excavation

campaigns in Sagalassos complete the information about this city and its environs. For the visual data about VE presentations internet sources and the DVD of the Sagalassos documentary film, by Axell Company, are utilized. The history and physical characteristics of the Pisidia region and the city are explained here as well as the archaeological remains and their present situation. The last section of the case study forms the critical discussion of this thesis: Physical presentation interventions realized on site are evaluated by the treatment of authenticity and intrinsic values. That is followed by an assessment of the VE presentations of Sagalassos for the broader audience. These two evaluations complement each other.

In the conclusion chapter, a proposal is developed for the integration of VE applications within the presentation process of Sagalassos, in the light of the discussions. Some remarks are provided on the presentation of classical archaeological sites in VE in general.

This thesis aims to present the results of a study carried out in 2 years. Thus, the amount of material that has been investigated is proportional to the available time.

Only the Turkish and English references are cited here, due to the lingual limitations of the author. Yet, many German and Italian references exist on the subject. These are utilized up to a certain extent, mostly visually, but not cited within the thesis.

Most of the recent developments on the presentation of classical archaeological sites in VE are still on-going projects. The latest accessable information about these studies are often presented electronically over the Internet. The published material is generally composed of articles from international symposiums, rather than complete hardcopy books. None of the cited material on VE presentations (except the case study) are experienced directly. These projects are assessed by accepting the assumptions stated in the publications or web sites.

The choice of the target audience as the broader public is an obligation rather than a preference for this study: Almost all of the comparative examples, that the author could investigate, are aimed at non-professional visitors of classical archaeological sites. Yet the author includes only the projects that had clearly stated their target audience as the broader public. There have been rare cases where the projects had been developed for academic purposes. But then, the archaeological evidence necessary to check the accuracy/ validity of the projects had not been available for the author.

Although the material of the case study on Sagalassos has been developed for the scholarly discussions and broader public seperately, the accessable examples only include the ones for the non-professional audience.

CHAPTER 2
THE PRESENTATION OF CLASSICAL ARCHAEOLOGICAL SITES
IN VIRTUAL ENVIRONMENT

2.1 History of Presentation Theory and Methods for the Archaeological Heritage

Starting from 17th century onwards, "Grand Tours" were a part of the education and entertainment program of the European elité. These were organized travels to see the cultural and natural heritage throughout Europe.[1] During the late 18th century, the profile of the travellers changed, scientists became the majority and the scope of the travels expanded to include Turkey (Asia Minor), Middle East, North Africa or Armenia.[2] Due to the rise of romanticism and appreciation of ancient civilizations, picturesque ruins were attracting a lot of attention. Thus, it was very common to see panoramas of archaeological sites in publications.[3] Mostly engravings and ortographic drawings were utilized to present this heritage. The excavations in Pompei & Herculaneum (mid 1700s) was an outcome of this interest, too.[4]

Almost half a century later, in mid 1800s, the whole concept of presentation of cultural heritage changed due to the invention of analogue

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[1] Löschburg, W., 1998, *Seyahatin Kültür Tarihi,* Dost Kitabevi, Ankara, p. 53.

[2] To give a few names of the most known ones: Cockerell, R., 1903, *Travels in Southern Europe and the Levant, 1810- 1817,* London; Beaufort, F., 1818, *Karamania,* London; Arundell, F. V. J., 1834, *Discoveries in Asia Minor,* London; Hamilton, W. J., 1842, *Researches in Asia Minor, Pontus and Armenia,* London.

[3] Veltman, K., 1999, "World Access to Cultural Heritage: an Integrating Strategy", *Beni Culturali, Reti Multimedialita,* Politecnico di Milano, Milano, p. 73.

[4] Kuban, D., 2000, Tarihi Çevre Korumanın Mimarlık Boyutu, YEM Yayın, İstanbul, p. 25.

photography and photogrammetry.[5] Analogue photography held the primary place for the presentation of cultural heritage together with ortographic and perspective drawings until the second half of the 20th century, especially for the remote audience.

Looking at the on-site interventions, one would find a lot of stylistic restorations in newly excavated areas. This attitude aimed at returning the monuments to their "original state". In practice, this meant destroying all additions and making hypothetical reconstructions. Italy under the reign of France was the pioneer for such interventions.[6] Stylistic restorations continued to be realized for a couple of decades as their impact spread to other countries, too.

Another method was didactic presentation. This was the random display of finds, especially decorated architectural elements or statues, at locations away from their original context, with different relations and different dimensions.

While the interest for archaeological sites culminated in 1800s, Turkey was ready to take its share: In 1870, excavations initiated in Troy, then in 1878 Pergamon started.[7] In 1883, Osman Hamdi Bey made an excavation on the Nemrud Mountain and published the results in a book. Here, he stated the necessity of presentation of this archaeological site for the broader audience.[8] In 1895 Ephesos excavations followed.[9]

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[5] Cannataci, J. A. et al., 2003, "E-Heritage, The Future for Integrated Applications in Cultural Heritage", *CIPA 2003 XIXth International Symposium, 30 September – 04 October, 2003, Antalya- Turkey*, CIPA, İstanbul, p. 82.

[6] Kuban, D., 2000, Tarihi Çevre Korumanın Mimarlık Boyutu, YEM Yayın, İstanbul, p. 25.

[7] Radt, W., 2002, *Pergamon,* YKY, İstanbul, p. 292; Zemanek, B., 2004, "Der Freunde von Ephesos", http://www.ephesos.at, accessed on 23 February 2005.

[8] Hamdy Osman Bey & Osgan Effendi, 1987, *Reprint of Le Tumulus de Nemroud- Dagh: Voyages, Description, Inscriptiones,* 1883, Constantinople: Pera, Loeffler*,* Archaeology and Art Publications, edited by Nezih Başgelen, İstanbul.

[9] Radt, W., ibid.

	18th century	19th century	1900's	1910's	1920's	1930's	1940's	1950's	1960's	1970's			
Development of Presentation Theory and Methods for the Archaeological Heritage	*Late 18th century, panoramas of archaeological sites in publications. (Veltman, 1999) Engravings presented the archaeological heritage together with ortographic drawings. These originated from the rising interest in antiquity. The excavations in Pompei & Herculaneum (mid 1700s) was an outcome of this interest, too.(Kuban,2000)	*Mid 1800's, analogue photography and photogrammetry were invented. The interest in photography was united with the interest in ancient sites. (Cannataci,2003) *Restorations were done which turned the sites to their "original" state. (stylistic restoration) These interventions included a lot of reconstructions, too. Italy under the reign of France was the pioneer. (Kuban, 2000)	*Early 20th century, stylistic restorations together with reconstructions continued in archaeological areas. (Kuban,2000)			*1931, Athens Charter. Stylistic restoration was rejected. Anastylosis was proposed for archaeological heritage. Use of modern materials, especially concrete was encouraged in new restorations. Picturesque perspectives were also favourable. (Erder, 1975)		*1950s, shelters were begun to be utilized on archaeological sites, the primary aim being protection and secondary aim presentation. Piazza Armerina was the first example of its kind. (Aslan, 1997) *Information panels, signs, visitor paths and other services became a part of the presentation process on archaeological sites. *1956, New Delhi Charter	*1960, cultural tourism was slowly adapted to finance the conservation process of CH sites. Thus, presentation became a vital issue in the conservation decision making process. (Pieris, 1993) *1964, Venice Charter "All reconstruction work should be ruled out a priori". The need for the presentation of the archaeological sites to the public was mentioned implicitly. (Madran & Özgönül 1999) *1969, European Convention	*1970s, restoration theory moved away from the protection of single monuments towards preservation of the whole site. (Kuban,2000) *Hand drawn graphic reconstructions of archaeological sites or edifices and models were started to be utilized for presentation purposes, either on site or away from the site.		*1990, Reilly presented "Towards a Virtual Archaeology" in CAA. (Gillings, 1997) His article was the acceptance of VE as a medium for the presentation of arch. heritage. *Virtual museums were begun to be utilized, the Uffizi being a pioneer. (Veltman, 2003) *VE presentations became a part of on-site presentation process. (Pletincx, 2000) *1990, International Charter for Archaeological Heritage Management *1992, Valetta European Convention	*2002, Icomos Ename Charter was declared to set the basic principles and guidelines of heritage interpretation. (Icomos,2004) *European visions of internet assume a multilingual context & greater emphasis on culture and history. (Veltman, 2003) Thus cultural heritage is presented online for the remote audience, too.
Development of Presentation of Archaeological Heritage in Turkey	*Archaeological sites of Turkey had been frequently visited and presented in books by many European travellers since late 1700s.	*1870, Troy excavations started. (Radt,2002) *1878, excavations started in Pergamon. (Radt,2002) *1883, Osman Hamdi Bey made an excavation on the Nemrud Dagh and published the results in a book. Here, he stated the necessity of presentation for the broader audience. *1895, excavations started in Ephesos. (Zemanek, 2004)	*During 1900-1911 Dörpfeld realized some restoration projects in Pergamon. Including the depot-museum on the lower agora, these interventions were aimed at improving the presentation of this archaeological site for the visitors. (Radt, 2002)					*1957, Karatepe Open Air Museum by Cansever made use of concrete shelters over the archaeological ruins. (Çeliker, 2004)	*Until early 1960s, there were 15-20 archaeological research projects in Turkey. (Özdoğan, 2001)	*1978, the anastylosis of the Celsus Library in Ephesos was completed. (Strocka, 1979)	*1981, a reconstruction project was realized in Sardis "to present a complete Lydian roof and revetment tiles, in an authentic context & outdoor environment". A display structure representing a hypothetical Lydian building was constructed of concrete, covered with a stone socle, mudbrick and mud plaster. (Greenewalt, 1983)	*1990, Tetrapylon of Aphrodisias was inagurated after the completion of its anastylosis. (Smith, 1991) *Çatalhöyük Project started working on virtual presentation.	*2000s, archaeological sites started to make use of VE presentations like Assos, Ancyra, Aizonai, Pergamon, Ephesos, Aphrodisias, Patara, Sagalassos etc. Some of these research projects (Çatalhöyük, Sagalassos) are studying towards the construction of virtual museums.
Development of Computer Graphics and Virtual Reality									*1961, Sutherland created "Sketchpad" which would be the origin of today's dwg softwares. (Sevo,2004) *1966, Sutherland created Head Mounted Display, which would initiate VR. (Sevo, 2004) *Late 60's, hidden surface algorithm developed in University Of Utah.(Sevo, 2004)	*1971, prototype of PC, microprocessor was developed.(Sevo,2004) *1974, Texture mapping was introduced by Catmull.(Sevo, 2004) *1976, Bump mapping was developed by Blinn.(Sevo, 2004) *1977, applications of comp graphics as 2D & 3D drafting, remote sensing, military simulation, medical imaging & business graphics.(Sevo,2004) *During 70's, comp graph. were mainly developed and utilized by film industry.(Sevo, 2004)	*1981, IBM introduced the first personal computer. The PC broke into the business community.(Sevo,2004) *1982, Autodesk Inc. was established.(Sevo,2004) *1983, the first version of Autocad was released by Autodesk.(Sevo,2004) *1983, Data Glove was developed by Lanier.(Wikipedia,2004) *1989, Lanier coined the term "Virtual Reality".(Wikipedia,2004)	*1990, Autodesk released its first 3D computer animation product, 3D Studio. (Sevo, 2004) *1990, WWW was created.(Veltman,2003) *1995, 5 million users of internet, 95% of internet was in English. (Veltman,2003)	*2003, 650 million users of internet.35% of internet is in English, 15% in European languages, 26% in Asian languages. (Veltman, 2003)
Utilization of Virtual Environment (VE) for the Presentation of Archaeological Heritage										*1973, *Computer Applications in Archaeology* Conference was held at the University of Birmingham.(___, 2004, "About CAA...") *1978, the first multimedia and VR system which presented cultural heritage, Aspen Movie Map was created at MIT. (Wikipedia, 2004)	*1985, virtual reconstruction of 'the Old Winchester Cathedral by IBM UK Scientific Center. (MacDonald,2001)	*During 90's the use of comp appls for arch. site presentation developed as comp graphs and VR.(Forte,2000) *1991, Institut National de L'Audiovisuel and IBM project, the Cluny Abbey. (Veltman, 2003) *1994, Art+Com's T-Vision project simulated a path from the satellite image of the earth to an object in a building.(Schmidt,1997) *Ename974 Project united VE applications with on-site archaeological presentation. (Pletincx, 2000)	*2000, more than 200 websites containing "virtual archaeology". (Forte,2000) *2004, almost 7770 websites containing the same keywords. (author) *ArcheoGuide in Olympia united VE presentation with in situ ruins. (Ioannidis, 2002)

Figure 2.1.1. The history of presentation theory and methods.

During 1900-1911 Dörpfeld realized some restoration projects in Pergamon. Including the depot-museum on the lower agora, these interventions were aimed at improving the presentation of this archaeological site for the visitors.[10]

In 1931, Athens Charter was declared. Here stylistic restoration was rejected and anastylosis was proposed for the conservation of archaeological heritage. Use of modern materials, especially concrete was promoted in new restorations. The charter encouraged the protection and formation of picturesque panoramas.[11]

From 1950s onwards, shelters were begun to be utilized on archaeological sites, the primary aim being protection and secondary aim presentation. Piazza Armerina was the first example of its kind.[12] This attitude found its reflection in Karatepe, Adana, in 1957, when Turgut Cansever realized an open air museum making use of concrete shelters over the ruins.[13] Surely, information panels, signs, visitor paths and other services were slowly being utilized to improve the presentations, too.

In 1956, the New Delhi Recommendation stressed the importance of raising interest of the archaeological remains for the visitors.[14]

From 1960 onwards, cultural tourism became a serious impact on heritage sites with positive and negative sides: masses of people were

[10] Radt, W., ibid.

[11] Erder, C., 1975, *Tarihi Çevre Bilinci,* METU Faculty of Architecture Press, Ankara, p. 280.

[12] Aslan, Z., 1997, "Protective Structures for the Conservation and Presentation of Archaeological Sites", *Journal of Conservation & Museum Studies,* No.3 November 1997, http://www.jcms.ucl.ac.uk, accessed on 21 February 2005.

[13] Çeliker, N., 2004, "Turgut Cansever", http://www.biyografi.net/kisiayrinti.asp?kisiid=571, accessed on 24 February 2005.

[14] Madran, E & Özgönül, N., 1999, "Recommendation on International Principles Applicable to Archaeological Excavations, New Delhi, 5 December 1956", *International Documents Regarding the Preservation of Cultural and Natural Heritage,* METU Faculty of Architecture Press, Ankara, p. 21.

eroding those places, yet a conciliation could adapt it as a financial and narrative tool both for research and conservation purposes. Thus, presentation became a vital issue in the conservation decision making process.[15]

In 1964, Venice Charter recommended that all reconstruction work should be ruled out on archaeological sites. The need for the public presentation was mentioned implicitly.[16]

In 1969, the European Convention obliged all the signatory states to promote the creation of a public opinion for the value of archaeological finds by presenting this heritage and disseminating information about it.[17]

During 1970s, restoration theory moved away from the protection of single monuments towards the preservation of the whole site.[18] Hand drawn graphic reconstructions of archaeological sites or edifices and models were begun to be utilized for presentation purposes, either on site or away from the site.

In 1978, the anastylosis of the Celsus Library in Ephesos was completed.[19]

The developments in information technology during 60's and 70's affected archaeology, too (Figure 2.1.1). Consequently, the *Computer Applications in Archaeology* conference was held at the University of

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[15] Pieris, S. & P. L. Prematilleke (Eds), 1993, *Cultural Tourism, Tourism at World Heritage Cultural Sites: The Site Manager's Handbook,* Icomos, Sri Lanka, p. 129.

[16] Madran, E. & Özgönül, N. (eds), 1999, "Venice Charter, The International Charter for The Conservation And Restoration Of Monuments And Sites, 31 May 1964, Venice", *International Documents Regarding the Preservation of Cultural and Natural Heritage,* METU Faculty of Architecture Press, Ankara, pp. 31- 4.

[17] Madran, E. & Özgönül, N., ibid, "European Convention on the Protection of the Archaeological Heritage, London, 6 May 1969", p. 82.

[18] Kuban, D., ibid.

[19] Strocka, V. M., 1979, *Belleten*, "Efes'teki Celsus Kitaplığı Onarım Çalışmaları", Volume 43, pp. 818-21.

Birmingham as early as 1973. Over the years, the conference would be annually organized by different British universities and after 1992 by international bodies.[20] Soon in 1977, different applications of computer graphics were begun to be discussed as 2D and 3D drafting (especially for architecture and design industry), remote sensing, military simulation, medical imaging and business graphics.[21]

The first multimedia and VR system was the Aspen Movie Map created at MIT in 1978.[22] This map allowed the user to take a virtual tour through the streets of Aspen, Colorado. This was done via two different methods. The first method involved taking video footage of the city in four directions, in winter and summer. Then these records were linked together and the user was allowed to choose one of the predefined paths to tour the city and move forward, back, left or right. The records also included the interior video images of prominent landmarks of Aspen, thus presentation of cultural heritage. The second method involved a very crude 3D model of the city rendered in real time. The user had the same options as with the video footage. A notable feature of Aspen Movie Map was a navigation bar which allowed the user to jump directly on a specific point on the Aspen map without the necessity of finding the way to that destination through the city streets. Because of this feature Aspen Map was considered the first example of a virtual reality system.

Archaeological use of Virtual Environments began in the mid 1980's with the construction of the Old Winchester Cathedral in 1985.[23] The IBM

[20] http://caa.leidenuniv.nl/about_caa.htm, accessed on 06 January 2005.

[21] http://hem.passagen.se/des/hocg_1970.htm, p. 7, accessed on 30 December 2004.

[22] http://en.wikipedia.org/wiki/Aspen_Movie_Map, accessed on 30 December 2004.

[23] MacDonald, A. S., 2001, *Virtual Archaeology: Virtual Reality as a Tool for the Exploration of Architecture*, MSc Thesis submitted to University of York, Department of Archaeology, September 2001, www.ascanadianaspossible.ca/publications/thesis.PDF, accessed on 05 January 2005.

UK Scientific Center produced a model using the software called WINSOM (Winchester Solid Modeller). The model was later used for the Biritish Museum's "Archaeology in Britain" exhibition, presenting an animated guided tour of a disappeared monument, the original Saxon Minster that was demolished during the 11th century.[24] The spread of PCs due to easy manipulation and comparatively low prices familiarized archaeology with computer graphics (Figure 2.1.1).

Meanwhile in our country, archaeology started using virtual presentation methods a decade later and preferred more traditional methods through 80's: In 1981, a reconstruction project was realized in Sardis "to present a complete Lydian roof and revetment tiles, in an authentic context & outdoor environment". A display structure representing a hypothetical Lydian building was constructed of concrete, covered with a stone socle, mudbrick and mud plaster.[25]

The International Charter for Archaeological Heritage Management of 1990 declared that presentation was essential to raise an understanding of the origins of the modern societies and the need for the protection of this heritage. The charter underlined the necessity of updating the information conveyed by any presentation, too.[26]

The Valetta Convention of 1992 highlighted presentation for the sake of sharing and developing scientific knowledge and educating the public. Promoting public access to important elements of archaeological heritage,

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[24] MacDonald, A. S., ibid.

[25] Greenewalt, H. et al., 1983, " Sardis, 1981 & 1982", *Türk Arkeoloji Dergisi,* Volume XXVI-2, Ministry of Culture and Tourism - General Directorate of Monuments and Museums, Ankara, p. 184.

[26] Madran, E. & Özgönül, N. (eds), ibid, " International Charter for Archaeological Heritage Management, 1990, Icomos/ Icahm", p. 390.

especially sites, and encouraging the display of archaeological objects could further support the creation of a public opinion.[27]

In 1990 at the *Computer Applications in Archaeology* conference Paul Reilly presented an article named "Towards a Virtual Archaeology" which discussed the technological, multidisciplinary and virtual archaeology of the future. He claimed that the virtual models could "act as a replacement for an original".[28] Reilly also showed some examples of three-dimensional visualisations representing virtually reconstructed stratified contexts.[29] His article was the acceptance of VE as a medium for the presentation of archaeological heritage.

Through the 90's the use of computer applications for archaeological site presentations developed in two major areas as computer graphics and virtual reality, the former being more preferred.[30] The main reason for this situation was that virtual reality applications necessitated elaborate workstations and hardware as opposed to computer graphics which could be run on PCs. Infact, the presentations of archaeological sites in VE grew

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[27] Madran, E. & Özgönül, N. (eds), ibid, " European Convention on the Protection of the Archaeological Heritage, Valetta, 17 January 1992", p. 416- 7.

[28] Gillings, M., 1997, "Engaging Place: a Framework for the Integration and Realisation of Virtual-Reality Approaches in Archaeology", *Archaeology in the Age of Internet: Proceedings of the 25th Anniversary Conference of the CAA, Birmingham, April 1997*, Proceedings CD/990217_1532/gillin/GILLIN.htm.

[29] Forte, M., 2000, "About virtual archaeology: disorders, cognitive interactions and virtuality", http://www.mmi.unimaas.nl/eculturenet/publicPDF/VRarcheo.pdf, accessed on 07 April 2004.

[30] "Computer graphics (CG) is the field of visual computing, where one utilizes computers both to generate visual images synthetically and to integrate or alter visual and spatial information sampled from the real world", quoted from http://en.wikipedia.org/wiki/Computer_graphics, accessed on 30 December 2004. Computer graphics involve photorealistic rendering without interactivity with the models; "Virtual reality describes an environment that is simulated by a computer", quoted from http://en.wikipedia.org/wiki/Virtual_reality, accessed on 30 December 2004. Virtual reality enables navigation in real time. The term is coined by Jaron Lanier in 1989; Forte, M., ibid.

in number parallel to the use of PCs. Towards the end of the 90's, more archaeologists began to take part in this field as user-developer.[31]

The creation of World Wide Web (WWW) in 1990 changed the whole concept of communication throughout the world. From then on one could reach anonymous audience at very remote locations.[32] The internet was a powerful presentation medium for heritage, too: virtual museums were put in service and Uffizi was the pioneer.[33]

One of the advantages of VE was that one could not only visualise but also create self-describing objects, objects which provided information about themselves in addition to their image. In 1991 Institut National de L'Audiovisuel and IBM worked together on the reconstruction of the Cluny Abbey which was destroyed during the French Revolution.[34] The reconstruction had an electronic guide in the form of a monk who could fly and lead the audience to different floors of the church.

Already in 1994, Art+Com's TerraVision (T-Vision) project could simulate a path from the satellite image of the earth to an aerial image of a city, entering a reconstruction of a physical building and focusing on a particular object in that building.[35]

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[31] Forte, M., ibid.

[32] "There were 5 million users of internet in 1995 and 95% of internet was in English", quoted from Veltman, K. H., 2003, "Europe's Cultural Heritage in the Digital Age", Digital Resources in the Humanities (DRH) Conference, 2003, University of Gloucestershire, Cheltenham Campus, September 2003, http://www.mmi.unimaas.nl/, accessed on 12 January 2005.

[33] Veltman, K. H., 2003, "Europe's Cultural Heritage in the Digital Age", *Digital Resources in the Humanities (DRH) Conference, 2003, University of Gloucestershire, Cheltenham Campus, September 2003,* http://www.mmi.unimaas.nl/, accessed on 12 January 2005.

[34] Veltman, K. H., 2003, "Historical Heritage and Future Creativity", http://www.mmi.unimaas.nl/eculturenet/publicPDF/donostia.PDF, accessed on 07 April 2004, p. 3.

[35] http://www.iamas.ac.jp/interaction/i97/artist_artcom.html, accessed on 08 January 2005. This technique is widely used in movies today.

In late 90's virtual presentations became a part of the on-site presentation process of archaeological sites. Ename974 Project was the pioneer to unite virtual reconstructions with in situ ruins by the help of projection kiosks in 1998.[36]

In Turkey, Çatalhöyük Project started working on the presentation of this archaeological site in VE through the 90's.

In 2002, "Icomos Ename Charter for the Interpretation of Cultural Heritage Sites" was declared.[37] The aim of the charter was to define the basic principles and guidelines for cultural heritage interpretation.

Through 2000's, internet was frequently pronounced for the presentation of archaeological heritage as European visions of WWW assumed a multilingual context and greater emphasis on culture and history.[38] Europe aimed at popularizing its heritage over the internet hoping to attract more visitors for the sake of culture and tourism. Consequently, in 2000, in the internet search engine Altavista, one could find more than 200 web sites containing the keywords "virtual archaeology".[39] Only four years later, it was possible to find almost 7770 web sites containing the same keywords in the search engine Google.[40]

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[36] Ename 974 Project, http://www.ename974.org/Eng/pagina/archeo_overzicht.html, accessed on 19 January 2005.

[37] "Icomos Ename Charter For the Interpretation of Cultural Heritage Sites, Second Draft, 24 June 2004", Icomos, http://www.icomos.org/icahm/enamecharter.pdf, accessed on 08 January 2005. Within the charter interpretation is defined as "the carefully planned public explanation or discussion of a cultural heritage site, encompassing its full significance, multiple meanings and values".

[38] In 2003, there were 650 million users of internet. 35% of internet was in English, 35% in European languages, 26% in Asian languages; Veltman, K. H., 2003, "Europe's Cultural Heritage in the Digital Age", *Digital Resources in the Humanities (DRH) Conference, 2003, University of Gloucestershire, Cheltenham Campus, September 2003,* http://www.mmi.unimaas.nl/, accessed on 12 January 2005.

[39] Forte, M., ibid.

[40] The search was done by the author on 05 January 2005.

In Turkey, many archaeological sites like Aizonai, Pergamon, Ephesos, Aphrodisias, Patara, Sagalassos, Assos, Ancyra, Metropolis started to make use of VE as a presentation medium. Some of these research projects like Çatalhöyük and Sagalassos are working towards the construction of virtual museums.

Today, the use of virtual environments for the presentation of archaeological sites can be observed all around the world in diverse fields.[41]

2.2 Aim and Scope of the Presentations in Virtual Environment

In terms of cultural heritage, presentation means publicizing the heritage in question which is the most important means of promoting the needs for its protection.[42] The aim is to explain the significance of the archaeological heritage, its authenticity and values. By this way, one hopes to educate the public and raise the conciousness for the protection of that particular site. Christel accepts the presentations as a didactic tool yet highlights another reason which can not be underestimated; funding.[43] There is certainly a vicious cycle between funding and the presentation of archaeological sites, too. For our topic, presentation necessitates bringing the classical archaeological sites to the attention of the audience, which is

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[41] As an example one can take a look at the *Proceedings of the XIXth International CIPA Symposium 30 September – 04 October 2003, Antalya*, CIPA, İstanbul, 2003. In the symposium several studies about the presentation of archaeological sites in VE were discussed. The projects were distributed to 28 different countries from all 5 continents.

[42] Article 7 of International Charter for Archaeological Heritage Management in Madran, E. & Özgönül, N. (eds), ibid, "International Charter for Archaeological Heritage Management, 1990, ICOMOS/ ICAHM", p. 390.

[43] Brown, D. et al., 2000, "Showing Off: Presenting the Results", *Graphics and Archaeology: Interpreting the Past, Snowbird, Utah, 20-23 May 2000,* http://www.siggraph.org/~fujii/campfire/archaeology/html/052100_7.html, accessed on 13 March 2003.

composed of different groups as professionals, decision makers (governmental and local administrators) and other users, usually visitors (adults and children).[44] Each group of people have their own demands from the presentation. Before the preparation of presentation, the target audience and their interests should be carefully defined[45]. This thesis focuses on the presentations for the broader audience or visitors.

Presentation of archaeological sites involves several aspects and different methods may be utilized. If the visitors are brought into close contact with the remains then services are extremely important on site. These start with access to the site, continued with parking for vehicles, appropriate ticket stands, shelters for protection against the sun & rain/snow, toilets, sitting/gathering/waiting areas, gastronomic facilities, lighting at night or at special times of the year, souvenir shops, accommodation etc.[46] But the primary concern of presentation involves providing information. This can be done on site by site arrangements like paths, observation platforms, signs, instruction panels or independent from the site through the use of human guides, books, booklets, maps, drawings, models, replicas, photographs, posters, audial or visual aids like tapes, films, videos, exhibitions, theatrical performances or combination of both on site and off site methods. Yet, the main role in providing information for classical archaeological sites is played by the remains themselves, through physical adjuncts or enhancements.[47] Thus the decisions regarding the

[44] Quintero, M. S., 2003, "The Use of Three Dimensional Techniques of Documentation and Dissemination in Studying Built Heritage", Unpublished PhD Thesis submitted to the Lemaire Conservation Center of the Catholic University of Leuven, Leuven, p. 100.

[45] Feilden, B. M., 1993, "Conservation and Tourism", *Cultural Tourism- Icomos 10th General Assembly*, Icomos, Sri Lanka, p. 59.

[46] Brooks, G., 1993, "Visitation to Major Heritage Sites - Some Essential Planning Considerations", *Cultural Tourism- Icomos 10th General Assembly*, Icomos, Sri Lanka, p. 15-6.

[47] Price, N. P. S., 1990, "Conservation and Information in the Display of Prehistoric Sites", *The Politics of the Past*, Unwin Hyman, London, p. 285.

heritage become crucial. It is important to investigate the impact of the presentation methods to understand the scope of VE, too.

Engravings have been the most important presentation medium of archaeological heritage before the invention of photography. As they contained a lot of detail, even today they are utilized as documents of that period. However, they are not always reliable as the foreground or background might have been rendered with artistic concerns rather than loyalty to the reality.

Photography is still an appropriate medium to represent the vividness of archaeological sites. But, if it is not supported with other mediums it just acts like a mirror instead of telling the story of the site.

Reconstruction is one of the most utilized methods. It means "building anew".[48] For reconstruction modern or old material can be used with the aim of rebuilding dismembered or destroyed elements, or parts of them. It must be based on "accurate archaeological and architectural documentation and evidence, never on conjecture".[49]

According to the Venice Charter all sorts of reconstruction is rejected.[50] Its validity is especially debatable when it is used as a measure to improve the presentation of heritage sites.[51]

Anastylosis is also considered as a type of reconstruction though it finds support in the field of cultural heritage preservation. But in our opinion

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[48] Feilden, B. M. & Jokilehto, J., ibid, p. 63.

[49] Feilden, B. M. & Jokilehto, J., ibid, p. 63.

[50] Madran, E. & Özgönül, N. (eds), 1999, "Venice Charter, Venice, 31 May 1964", *International Documents Regarding the Preservation of Cultural and Natural Heritage*, METU Faculty of Architecture Press, Ankara, p. 33. In cases of danger (like war, flood, earthquake, pollution etc) the relocation of a monument or part of it may become necessary so reconstruction is required, too. This requirement is illustrated in the case of the Temple of Abu Simbel, where the monument is dismantled, carried to a different site and rejoined there against the danger of being flooded.

[51] Feilden, B. M. & Jokilehto, J., ibid, p. 63.

anastylosis should be clearly seperated from reconstruction because it only uses original material whereas reconstruction is the opposite. If the ratio of new parts to the old starts to increase then this treatment becomes a reconstruction. Particularly for classical archaeological sites the problems arising due to reconstruction is underlined by Mertens: "For ancient stone architecture with its inherent logic of form, it is frequently possible to make scientifically correct reconstructions on paper although comparatively little of the original building survives. But even when a surviving building element can be placed successfully in its original position, the character of the modern reconstruction always remains dominant if too few of the original elements survive".[52] This fact not only destroys the intrinsic values of the single monument but also the values of the site/ setting in total because reconstructions create serious focal points within the ruined environments of excavations. They give a misleading impression of the monument's importance or visual appearance relative to neighbouring monuments.

Didactic restoration displays the remains (sometimes away from their original locations) with different relationships and details. This attitude may be the on-site equivalent of non-contextual museum displays. A dwarfed upper structure without columns or a statue on a wrong pedestal can be an example to such presentations. This technique may be utilized to bring the remains to the eye-level by reducing height or narrowing width. Yet, this fact makes it hard for the visitors to imagine the original appearance of the structures or relate them with their original location and function.

Protective shelters or enclosures preserve the authenticity of the material and design up to a certain extent. Combined with visitor walkways they can be effective for presentation, too. But, they are visually intruding elements.[53] Thus, they destroy the authenticity of the setting. In fact, it can

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[52] Mertens, D., 1995, , "Planning and Executing Anastylosis of Stone Buildings", *Conservation On Archaeological Excavations,* ed. N. P. Stanley Price, Rome, p. 115.

[53] Price, N. P. S., ibid, p. 287.

be rarely said that a roof of imaginative design has contributed aesthetic values to an otherwise flat site.[54]

Information panels and signs are highly utilized together with graphic reconstructions. If these are strategically positioned and designed in harmony with the site, they may be succesful. But, it has been frequently reported that visitors find it difficult to relate the actual remains with graphic reconstructions. Models may be more effective in this respect, as they provide information related to the setting as well. The main challenge with graphic reconstructions or models is the difficulty of updating.

The physical presentation methods, especially reconstructions, may sometimes damage the intrinsic values of the archaeological heritage or become deficient in telling its story. But the interpretation media of the history of the site should be chosen as effective as possible for all visitors, without harming the appearance or ambience of the heritage site.[55] Then one is confronted with the question "how is it possible to make complex and poorly preserved archaeological remains comprehensible to the general public?".[56] The presentations in VE can be the key to this challenge as they offer non-destructive but highly readable visualizations. Let us assume a scale of physical interventions on archaeological sites from consolidation (minimum) to anastylosis and reconstruction (maximum). In our opinion, after the preventive interventions are realized for the conservation of the remains the following steps may be replaced with VE presentations. Such a

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[54] Price, N. P. S., ibid, p. 287.

[55] Feilden, B. M. & Jokilehto, J., 1993, *Management Guidelines for World Cultural Heritage Sites,* Iccrom, Rome, p. 100.

[56] Quoted from the web page of the Ename 974 Project, http://www.ename974.org/Eng/pagina/archeo_overzicht.html, accessed on 19 January 2005.

study is carried out in Ename, Belgium and has won prizes for the promotion of optimum presentation with minimum intervention.[57]

Ename is an early medieval trade settlement which had been founded in 975 AD but continously settled until 1795 AD. The only remains preserved on site are composed of foundations which look like a labyrinth to the visitors. To tell the non-professionals what life on the site used to be like, augmented reality is utilized. The kiosks ("TimeFrames") placed within the site take video footage of the remains and juxtapose them simultaneously with 3D virtual reconstructions. Thus, the visitor can see what is original and what is hypothetical on the screen. Together with narration, a virtual guide and other images the system provides a clear interpretation of the evolution of the archaeological site over a thousand years.[58]

Figure 2.2.1. The concept of the Ename Project and the use of TimeFrames on site, (http://www.ename974.org/Eng/pagina/archeo_overzicht.html, accessed on 19 January 2005).

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[57] In January 1998, the project received the "Golden Scarab" as the best archaeological presentation in the Benelux countries and the same year it was awarded the "Flemish Monument Prize". The information is taken from the Ename 974 Project, ibid.

[58] Ename Project, ibid.

Figure 2.2.2. Snapshots from the interactive VE presentation of the Internet TimeFrame, (http://www.ename974.org/Eng/pagina/archeo_overzicht.html, accessed on 19 January 2005).

A similar but more interactive project is being realized under the name ArcheoGuide (Augmented Reality Based Cultural Heritage On Site Guide), using the ancient site of Olympia as the first case study.[59] ArcheoGuide makes use of augmented reality, 3D visualization, mobile computing and multi-model interaction systems. A tracking system determines the location of the visitor within the site. Based on the visitor's profile (either cultural site visitors, cultural site managers, researchers or content creators) and location, audio and visual information is presented. The visitors are free to interact with the system and change the level of information presented as well as the language.[60]

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[59] ArcheoGuide Project Web Site, http://archeoguide.intranet.gr/project.htm, accessed on 24 January 2005.

[60] ArcheoGuide, ibid.

Figure 2.2.3. Three different ways of information retrieval in ArcheoGuide; HMD-GPS-Laptop, PenTable and PalmTop, (Vlahakis, V. et al, 2002, "Virtual Reality and Information Technology for Archaeological Site Promotion", *5th International Conference on Business Information Systems, Poznan, Poland, 24-25 April 2002*, http://archeoguide.intranet.gr/publications.htm, accessed on 24 January 2005).

Figure 2.2.4. A snapshot from the VE presentation of ArcheoGuide showing the Filippeion and Temple of Hera, (http://archeoguide.intranet.gr/project.htm, accessed on 24 January 2005).

Although the main aim of the presentations in VE had originated from visualization today they are used in many other ways like academic research, conservation decision making (excavation & research, data

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acquisition & recording, data management & information production, conservation & restoration, presentation), education or distance learning, communication, simulation, tourism and so on. Generally, these fields are overlapping rather than diverging. Because most of the time the projects try to combine different phases in a consistent workflow, from excavation and documentation to analysis, publication and presentation.[61]

Through conservation decision making process, possible contents of the VE presentations for archaeological sites may be:

* VE can be used to simulate the excavation process.[62] Especially in the documentation phase, VE may keep detailed records of the uncovered objects.[63]

* The remote sensing techniques and 3D visualization encourage more archaeologists to quit digging and use alternatives for data acquisition. VE presentations change the discipline into one "without intrusion into or disturbance to local cultural heritage materials".[64] The GIS environment

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[61] Kirchner, S. & P. Jablonka, 2001, "Virtual Archaeology: VR Based Knowledge Management and Marketing in Archaeology First Results- Next Steps", *Proceedings of the 2001 Conference on Virtual Reality, Archaeology and Cultural Heritage, Greece*, ACM Press, New York, p. 235.

[62] For an early example see Dekoli, M., 1997, "A GIS and Hypertext-Based System for Excavation Documentation", *Archaeology in the Age of Internet: Proceedings of the 25th Anniversary Conference of the CAA, Birmingham, April 1997*, Proceedings CD/990217_1532/dekoli/DEKOLI.htm. Another example is presented by Doneus, M. et al, 2003, "Digital Recording of Stratigraphic Excavations", *CIPA 2003 XIXth International Symposium, 30 September–04 October, 2003, Antalya-Turkey*, CIPA, İstanbul, pp. 451-6.

[63] Wise, A. & Richards, J., 1997, "Digital Preservation in Archaeology", *Archaeology in the Age of Internet: Proceedings of the 25th Anniversary Conference of the CAA, Birmingham, April 1997*, Proceedings CD/990217_1532/wise1/WISE1.htm. The paper illustrates several attempts for digital preservation on an inter/national level throughout the world.

[64] See Sanders, D. H., 1997, "Virtual Worlds for Archaeological Research and Education", *Archaeology in the Age of Internet: Proceedings of the 25th Anniversary Conference of the CAA, Birmingham, April 1997*, Proceedings CD/990217_1532/sander/SANDER.htm.

brings together all the information accumulated through remote sensing and enables the researchers to build up virtual presentations.[65]

* Reconstructions of sites that have been completely destroyed that are based on comparative analysis, iconographic analysis, etc.[66] The reliability of information drops to a certain extent in such presentations, because what is displayed is purely interpretation.

* Reconstructions of sites which have become ruins such as the Roman Forum concerning the original state of which there are a series of competing theories.[67] In the data management phase, different alternatives or interpretations can be included within the presentation rather than one single proposal and discussed with a wider public.[68]

* Reconstructions of finds and mechanisms or virtual restitution. Such reconstructions may be utilized to virtually complete broken pieces of finds then execute the process on the real heritage.[69]

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[65] Although it is earlier than a classical archaeological site, the Kerkenes Archaeological Research Project provides a very good example to this case, where excavation is kept at a minimum level on a site of 2.5 km^2. See http://www.metu.edu.tr/home/wwwkerk/ for more information.

[66] Forte, M., ibid.

[67] Veltman, K., 1999, "World Access to Cultural Heritage: an Integrating Strategy", *Beni Culturali, Reti Multimedialita,* Politecnico di Milano, Milano, p. 73.

[68] Forte, M., 2000, "About virtual archaeology: disorders, cognitive interactions and virtuality", http://www.mmi.unimaas.nl/eculturenet/publicPDF/VRarcheo.pdf, accessed on 07 April 2004.

[69] An example is the Forma Urbis Romae Project led by Stanford University. Broken and weathered pieces of an ancient marble map of Rome, Forma Urbis, are recovered from the excavations in Italy over the years. Recently, 3 dimensionally scanned pieces are brought together virtually to see if they fit for a final physical reconstruction. See Forma Urbis Project, http://graphics.stanford.edu/projects/forma-urbis, accessed on 13 March 2003. A similar approach can be observed in Kalvin, A., "Using Visualization in the Archaeological Excavations of a Pre- Inca Temple in Peru", *Archaeology in the Age of Internet: Proceedings of the 25th Anniversary Conference of the CAA, Birmingham, April 1997,* Proceedings CD/990217_1532/kalvin/kalvin.htm. In this paper, the delicate, decorated plaster pieces of a pre-inca temple is analyzed by the use of virtual presentations. The aim is first to restitute the whole scheme, then realize a physical restoration. The fragility of the archaeological heritage is the main reason to choose the VE method in this case.

* Hypothesis testing.[70] By this way one can see if a building existed at a particular location or test dynamic events of antrophic, morphologic or geologic nature and so on.[71] Hypothesis testing in VE can also be used for the preparation of conservation or restoration projects.[72] One can complete broken pieces, try different materials to test their compatibility in terms of colour, texture, durability etc, make structural or acoustical analysis, examine deformations/decays and apply accelarated weathering to the remains, see the effects of a reconstruction on site if it will be physically executed, etc...

* Chromatic and material reproductions (frescoes, terracottas, pediments, painted tombs, etc...).[73] These applications are mostly used for restoration purposes of the listed features.

* Landscape reconstructions.

* Reconstructions of archaeological sites which are too sensitive to sustain large crowds of visitors such as Lascaux Cave or Tomb of Nefertari.[74] Such

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[70] Debevec, P. et al, 2000, *Graphics and Archaeology: Interpreting the Past, Snowbird, Utah, 20-23 May 2000,* http://www.siggraph.org/~fujii/campfire/archaeology/html/052200_6.html, accessed on 13 March 2003.

[71] As an example see Bell, T., 1997, "Reconstructing Archaeology from the Landscape: GIS, CAD and the Roman Signal Station at Whitby", *Archaeology in the Age of Internet: Proceedings of the 25th Anniversary Conference of the CAA, Birmingham, April 1997,* Proceedings CD/990217_1532/sander/SANDER.htm. The paper departs from a hypothesis and tries to prove the existence of a missing Roman signal tower at a particular location on the original coastline, which is flooded recently.

[72] See Camara, L. & Latorre, P., 2001, "Three-Dimensional Analytical Model Obtained by Photogrammetry- Segmentation, Operation and Applications in the Field of Architectural Restoration", *Proceedings of the XVIII. International Symposium CIPA 2001, Potsdam, Germany, September 18-21 2001,* Potsdam, pp. 125-31. Although the project illustrates the study on a medieval cathedral the use of VE presentations can be integrated with the same logic in classical archaeological areas, too.

[73] Andrews, D. P. et al, "Photographic Survey Of Mosaic And Tiled Floors – A Methodology", *2003 XIXth International Symposium, 30 September – 04 October, 2003, Antalya- Turkey,* CIPA, İstanbul, pp. 241-6.

[74] Veltman, K., ibid.

reconstructions provide access to the archaeological heritage yet preserve the original site. Moreover they may even give a better visualization medium in terms of lighting.

* Reconstructions of sites that have not been conserved but of which remains an ample documentation.[75] The subject of salvage excavations can be reconstructed under this category. Infact, this is the only way to visualize such sites and inform the public.[76]

* Original sites and contexts of objects now in museums,[77] e.g. the original location of Zeus Altar (in Berlin Museum) on the Pergamon Acropolis.

* Reconstructions which bring together rare pieces or collections, which one could not move,[78] e.g. different artifacts of the same archaeological site which are owned by different museums or individuals.

* Virtual Museums.[79] Virtual museums enable access to any kind of digital data for the remote audience.

* Reconstructions and/or simulations by telematic networks (metaphor of the VRML and JAVA languages).[80] Such projects can be disseminated through the internet or CD- ROMs, thus may be used for popularization of the archaeological heritage and preservation.

Surely the end products of the mentioned studies can be used with purposes other than conservation decision making.

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[75] Forte, M., ibid.

[76] As an example see the documentary film by TRT especially for the flooded parts of Zeugma. "Zeugma Dün...Bugün...", 2002, TRT, directed by Kerime Senyücel.

[77] Veltman, K., 1999, ibid.

[78] Veltman, K., ibid.

[79] Veltman, K., 1999, ibid.

[80] Forte, M., ibid.

Virtual presentations are becoming an integral part of education, edutainment[81] and games by now. One of the goals can be to educate the population to have a context before they see the real archaeological heritage.[82] Another goal is distance learning/ education.[83]

Real simulation studies are rarely carried out for the presentation of classical archaeological sites due to the need of elaborate and expensive hardware. Yet, one can find different trials on the subject.[84] The user may be able to manipulate a 3D image using limited controls, for example a fly-through or panoramic image. Recently some projects are on the way to decrease the use of high performance workstations and introduce cheap desktop PCs for the production of VR simulations.[85]

Communication also benefits from VE. A 3D model which is formed for archaeological research purposes can be modified to be used in television or movie industry.[86] Such studies help to popularize the

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[81] The combination of the words "education" and "entertainment".

[82] Brown, D. et al., "Showing Off: Presenting the Results", *Graphics and Archaeology: Interpreting the Past, Snowbird, Utah, 20-23 May 2000,* http://www.siggraph.org/~fujii/campfire/archaeology/html/052100_7.html, accessed on 13 March 2003.

[83] Henry, W., 2000, "Getting Caught Up: Information Technology and Conservation", *Conservation: The GCI Newsletter,* Volume 15 Number 1, p. 14. At the University of Western Sydney, the Nepean School of Civic Engineering and Environment offers a master of applied science in material conservation also available by distance learning.

[84] Kantner, J., 2000, "Realism vs. Reality: Creating Virtual Reconstructions of Prehistoric Architecture", http://sipapu.gsu.edu/SAA00/, accessed on 09 January 2005. The paper on this site contains VR presentations of prehistoric structures located in New Mexico.

[85] Forte, M. et al., "Reconstructions of archaeological contexts in OpenGL environments", *Workshop- Archaeologie und Computer,* http://www.archaeologie-wien.at/workshop/Workshop_old/workshop/pop32.htm, accessed on 05 January 2005. DVR-Archaeology Project (Desktop Virtual Reality) supported by CNR-ITABC (Institute of Technologies Applied to Cultural Heritage) is an example to such efforts. The first project in this field is the DVR Pompei, the construction of a 3D digital informative spatial system of "Casa dei Vettii".

[86] Recently, CINECA (Consorzio Interuniversitario) is working with RAI Television for transforming a virtual reconstruction of Pompeii into a virtual set for the television programmes within the RVM4VSET Project (Research Virtual Models for Virtual Set Usage).

archaeological sites and rise interest for the ancient past. Nowadays, it is not surprising to see a virtual reconstruction of an ancient temple among the web pages of a tourism agent.[87] Nor is anybody unfamiliar with the VCDs or DVDs of Pompeii or Acropolis of Athens being sold on the streets, which contain numerous virtual reconstructions. These constitute one of the most popular souvenirs in the market. Meanwhile, edutainment for the tourists is not a hard goal to achieve.[88] A current Turkish project studies Ephesos, as a test case, to produce a database and virtual presentations with different practical purposes as cultural tourism, entertainement, construction works etc.

The greatest difference of VE from other presentation tools or mediums is that it enables to visualize the structures or physical environment as well as the human beings & other tangible or intangible elements of life (like worshipping, domestic life, beliefs, clothing, feeding habits, music etc…), thus help to build up a relationship between these.

If we are to sum up the general characteristics of presentations of classical archaeological sites in VE:

- VE presentations help the visitors to come into contact with the archaeological heritage through the screen (even the minutest detail can be investigated); this fact **saves the original site from destruction** up to a certain extent.

More info can be gathered at http://www.cineca.it/HPSystems/Vis.I.T/Researches/rvm4vset.html, accessed on 10 January 2005. Several films have used virtual reconstructions of classical archaeological sites like "The Gladiator (2000)" or "Troy (2004)".

[87] The Temple of Athena in Assos is subject to such an advertisement in http://www.assosadonis.netfirms.com, accessed on 13 November 2004.

[88] Altan, M. et al., "A Preliminary Application and Proposal for Cultural Heritage Network of Western Anatolia by Using Remote Sensing and Geographic Information System", *CIPA 2003 XIXth International Symposium, 30 September – 04 October, 2003, Antalya- Turkey*, CIPA, İstanbul, pp. 161-5.

- **Reversibility**. Unlike physical interventions any command given in the virtual reconstructions can be reversed. They are easy to dismantle, erase etc.

- These presentations are very **tolerant to updating** because the given data can be modified at any time. Thus, the accuracy of the models is ensured.

- Either on a CD Rom, DVD or through the World Wide Web the VE presentations of classical archaeological sites **can be disseminated easily**. This fact increases the availability of discussions for the scholars.

- Easy dissemination brings **easy popularization**, too. Colourful and dynamic graphics attract a lot of audience.

- They are **interactive** and enhance learning. Moreover, they may even provide connection between multi users and turn the visualization into a public experience.

- The "language" of VE presentations may vary from very **graphic/ abstract levels to photorealism**. The level of abstraction or realism can be determined according to the subject and reliability of information.

- The presentations do **not only appeal to the eye but also contain audio data**. In the future, perhaps other senses will also be included.

- Most of the time the content of the VE presentations are **based on multidisciplinary researches**, like geology, archaeozoology, archaeobotany, geophysics, archaeometry, anthropology etc.

- The presentation can **display different scales of models**, from a satellite image, down into an urban model, a reconstruction of an edifice and an artifact. Most important of all, the presentation may **offer hierarchical relationships**.

- The presentation may **include temporal changes or historical stratigraphy**. This is especially important for stratified archaeological sites where the stratas are observed not only on urban level but also on building scale.

- The VE presentations are not only composed of models but also **hypertexts** which give simultaneus information and further references about what is displayed on the screen.

- The data and models in VE presentations **interact in real time**. This is one of the most appealing characteristics of virtual presentations.

- Virtual presentations may **include contexts which can not be presented by physical interventions** like architectural, vegetational, topographical, social or climatic context.

- The information or what is presented **can be released from the territory** (although contextualization is more preferred).

- **Literacy**: virtual communications noticeably increase the informative level.[89]

The advantages of presenting classical archaeological sites in VE seem numerous. But some inherent problems within the process are reported by different scholars.

VE presents the information in an isolated, abstract reality confined within itself. No matter how close it comes to physical reality, it always represents an interpretation in a defined order, at certain levels of knowledge, decided by an outsider to be experienced by the audience. Most VE presentations are sophisticated surrogates of archaeological heritage, visually devoured without ever being questioned by this non-professional audience. However, the reality is an experience of numerous inputs and

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[89] Forte, M., 2000, "About virtual archaeology: disorders, cognitive interactions and virtuality", http://www.mmi.unimaas.nl/eculturenet/publicPDF/VRarcheo.pdf, accessed on 07 April 2004.

contains more alternatives than usually mentioned. Few VE presentations make their audience aware of this fact.[90]

Other problems faced during the applications of VE presentations of archaeological sites can be grouped as problems related to the creation process of VE presentations and problems related to the information conveyed by the VE presentations:

Problems related to the creation process of VE presentations:

The aim of producing VE presentations is not defined from the beginning of the research projects. They are often not seen as an integral part of the conservation decision making process, but rather "attached" to it afterwards.[91]

A major problem is the lack of communication between information users (conservation specialists and managers) and information providers (photogrammetrists, heritage recorders, computer scientists etc.).[92] Thus, providers can not understand the needs of the users and this results in deficient VE presentations without a definite goal.

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[90] Gillings, M., 1997, "Engaging Place: a Framework for the Integration and Realisation of Virtual-Reality Approaches in Archaeology", *Archaeology in the Age of Internet: Proceedings of the 25th Anniversary Conference of the CAA, Birmingham, April 1997*, Proceedings CD/990217_1532/gillin/GILLIN.htm; Barcelo, J. A., "Virtual Museums. When Heritage Does Not Exist", http://www.ace.hu/tudvil/barceloe.html, accessed on 07 January 2005; Ogleby, C., 1999, "How Real is Your Reality? Verisimilitude Issues and Metadata Standards for the Visualization of Cultural Heritage", *CIPA International Symposium 1999, October 3-6 1999, Olinda- Brazil,* http://cipa.icomos.org/fileadmin/papers/olinda/99c207.pdf, accessed on 16 January 2005.

[91] Gillings, M., 1997, ibid.

[92] Letellier, R. & Gray, C., "Bridging the Gap Between Information Users and Information Providers- RecorDIM Final Report of Round Table Meeting, Los Angeles, California, March 4-5 2002", Getty Conservation Institute, California, June 2002, p. 7.

Sometimes the compatibility of old and newly restored data can not be ensured especially when different versions of softwares are used.[93]

Problems related to the information conveyed by the VE presentations:

Looking at the vast number of projects, one expects to find some standardization or guidelines within the studies, yet it is rarely the case.[94]

The level of abstaction is sometimes taken to the level of cloning architectural elements or artefacts. This is mainly due to the nature of computer graphics that are generally based on copy/ paste functions and mass drawing. Yet, few antique buildings (maybe none) have identically similar architectural elements. This may be misleading.[95]

The presentations do not differentiate the initial information that the archaeologists have in their hands from interpretation.[96]

The presentations do not offer alternatives for the reconstructions. The audiences are interested in the process, especially at how one arrives at his/her interpretations.[97] The credibility of these are also not questioned.[98]

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[93] Wise, A., 1997, "Digital Preservation in Archaeology", Archaeology in the Age of Internet: Proceedings of the 25th Anniversary Conference of the CAA, Birmingham, April 1997, Proceedings CD/990217_1532/wise1/WISE1.htm.

[94] Letellier, R. & Gray, C., ibid, p. 10.

[95] Quintero, M. S., 2003, "The Use of Three Dimensional Techniques of Documentation and Dissemination in Studying Built Heritage", Unpublished PhD Thesis submitted to the Lemaire Conservation Center of the Catholic University of Leuven, Leuven, p. 25.

[96] Forte, M., "About virtual archaeology: disorders, cognitive interactions and virtuality", http://www.mmi.unimaas.nl/eculturenet/publicPDF/VRarcheo.pdf, accessed on 07 April 2004.

[97] Brown, D. et al., "Showing Off: Presenting the Results", *Graphics and Archaeology: Interpreting the Past, Snowbird, Utah, 20-23 May 2000,* http://www.siggraph.org/~fujii/campfire/archaeology/html/052100_7.html, accessed on 13 March 2003.

[98] Forte, M., ibid.

The presentations are not treated as information providing mediums but as "nice pictures". The graphic evidence is not supported with other mediums of data.[99]

2.3 Techniques/ Methods

There are several techniques to present a classical archaeological site in VE. The archaeologist should clearly define the aims to use VE presentations and direct the research from the beginning of data acquisition on site.

Archaeologists, architects, computer scientists, graphic artists, multimedia experts may take part in the VE presentation and particularly virtual reconstruction of any site. But it is better if the project is carried out as an interdisciplinary team work, led by an archaeologist.[100]

Panoramic image technology provides new facilities to present the archaeological heritage in VE. Image based visual reality is an approach for the documentation and presentation of archaeological sites avoiding the time consuming modelling process needed for a virtual reconstruction.[101] Some firms producing digital cameras also offer softwares to stitch single images into panoramas. Apple's QVTR Authoring Studio for the Macintosh or Picture Work's Spin Panorama and PhotoVista from LivePicture for the PC

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[99] Gillings, M., 1997, "Engaging Place: a Framework for the Integration and Realisation of Virtual-Reality Approaches in Archaeology", *Archaeology in the Age of Internet: Proceedings of the 25th Anniversary Conference of the CAA, Birmingham, April 1997*, Proceedings CD/990217_1532/gillin/GILLIN.htm.

[100] Forte, M., ibid.

[101] Pomaska, G., 1999, "Documentation and Internet Presentation of Cultural Heritage Using Panoramic Image Technology", *CIPA International Symposium 1999, October 3-6 1999, Olinda- Brazil,* http://cipa.icomos.org/fileadmin/papers/olinda/99c405.pdf, accessed on 16 January 2005.

are known products. VideoBrush Panorama captures video sequences and converts them into panoramas.[102]

Most of the time the end product may contain virtual reconstructions, too. However, the aim should not be to reconstruct virtually but to use the technologies in a methodological reconstructive way.[103]

The first step of VE presentations is data acquisition. Different approaches exist for data acquisition on site like video capture, photogrammetry, computer tomography, laser scanning etc. Computer tomography and laser scanning directly acquire 3 dimensional data in the form of points whose x,y,z coordinates are exactly known. However, the data acquired through video capture and photogrammetry has to be processed before it can be used. Recently, there are softwares available on the market which can develop 3D models from raster images or video sequences without the need for a metric measurement. Photomodeler by Eos Systems is an example to such an application.

If the data is not digitally available but provided on paper, then one has to digitize all the existing drawings (plans, elevations, sections...). For this aim, first the drawings are scanned, then the lines are digitized in a vector program by going over each of them.

The second step is the classification and elaboration of the data acquired during the field work as the following virtual processing is planned.[104] At this stage, a certain amount of abstraction may be necessary for the acquired data because "reality conveys infinite amount of

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[102] Pomaska, G., ibid.

[103] Forte, M., "About virtual archaeology: disorders, cognitive interactions and virtuality", http://www.mmi.unimaas.nl/eculturenet/publicPDF/VRarcheo.pdf, accessed on 07 April 2004.

[104] Forte, M., ibid.

information".[105] For instance, the redundant data/ noise[106] should be removed if the raw data is in the form of point clouds. Yet, for conservation science noise is critical because it is a representation of the irregular, weathered condition of the heritage. So a methodology should be adapted for consistent abstraction and the abstraction process itself should be documented and presented.[107]

The reconstruction can be 2 or 3 dimensional. The missing parts of the site or building (or artifact) may be completed by copying the existing parts or producing new hypothetical elements. The final product is a wireframe, solid or NURBS model. For 2 dimensional drafting (as vector graphics) Autocad and Adobe Illustrator are the most preferred softwares, though many others exist. For 3D modelling 3D Studio Max, Wavefront are mostly used.

After the geometrical model is produced the rendering step starts. This can be done using different algorithms. Either photorealistic or synthetic textures are utilized to create realistic images. Finally, the corrrect choice of illumination completes the presentation.

Most of the GIS environments (ArcView by ESRI, other softwares by Intergraph and MapInfo) are capable of creating continous 3D landscape surfaces (DTM) from 2D topographic data (either in the form of points or vectors). Then, on top of this base data, satellite or aerial photos (raster data) or other architectural features (vector data) can be overlaid.

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[105] Smars, P. et al, 2001, "Layered Geometric Information System", *Proceedings of the XVIII. International Symposium CIPA 2001, Potsdam, Germany, September 18-21 2001,* Potsdam, p. 463.

[106] "The points that are reduced in the process of modelling three dimensional entities by the use of regular geometric primitives", Quintero, M. S., 2003, "The Use of Three Dimensional Techniques of Documentation and Dissemination in Studying Built Heritage", Unpublished PhD Thesis submitted to the Lemaire Conservation Center of the Catholic Universty of Leuven, Leuven, p. 135.

[107] Quintero, M. S., ibid.

The produced virtual reconstruction can be the only feature in the computer screen as the presentation unfolds. However, it is always important to provide the original state of data and the result of the interpretations. For this aim, augmented reality is used. Technically speaking, at present, most augmented reality researches are dealing with live video imagery which is processed digitally and enhanced by the addition of computer generated graphics.[108]

Another important feature of the VE presentation should be interactivity.[109] Independent from its production aim, be it a research tool or a popular visualisation, immersive graphics enhance learning. Moreover, it is a way to test its validity, too.

The virtual reconstruction is mute if it can not describe itself. Thus, to turn the models into self-describing objects, hypertexts can be added to the presentations. Or a voice-over can tell the story of what is being displayed on the screen. Sometimes a virtual guide is also included, too. These accompanying features constitute or enhance the informative aspects of VE presentations.

Some of the most used languages for virtual presentations are:

QTVR (Quick Time Virtual Reality, created by Macintosh but also usable on a PC, file with extension .mov), permits the interactive visualisation of photographic and photomosaic panoramas, both real and virtual (created by computer graphics). The photographic sets, mounted in sequence in a virtual reality, represents an immersive, pseudo-dimensional panorama, that the user can explore in an interactive way. Such applications are often used on Internet for the virtual visiting of museums and exhibitions, archaeological digs and for the navigation within virtual

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[108] http://en.wikipedia.org/wiki/Augmented_reality, accessed on 30 December 2004.

[109] Forte, M. et al, 2000, "The Diversity of Archaeological Virtual Worlds", *Virtual Reality in Archaeology,* http://www.learningsites.com/Support_pages/BFS_VRinA_intro.html, accessed on 05 January 2005.

models.[110] It should be noted that in such applications, the model remains in its place. It is the user who changes his/her point of view.

Realspace- Photovista (by Livepicture, file extension .ivr), has similar functions as QTVR. But this program may contain real 3D solids created in the VRML format. So one can use a panoramic photo as a background to a virtual reconstruction of a building or a site.[111]

Flash is a software created by Macromedia to create multimedia presentations on line from WWW.[112]

Quick Time, Movie (file with extension .mov, .avi), is a known form of movies and animation, including particular algorithms in order to be seen on line. In archaeology they are used for the virtual tours of museums, but also as documents themselves, excavation documentation films, advanced computer graphics, etc.[113]

"JAVA is a compiler of programs, defined as applets, that are created to function and interact on line, independently from the hardware package or operating system. Some applications of Java have also been used for drawing the hypermedial maps of important museums, such as the Louvre. Other interesting applets were developed for GIS applications, such as the 2D-3D visualisation of thematic maps or of georeferenced satellite images."[114]

"VRML (Virtual Reality Modelling Language) is used for describing 3D image sequences and possible user interactions with them. By VRML, it is possible to build a sequence of visual images into Web settings with which a

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[110] Forte, M., ibid. Real estate agencies have recently started to make a lot of use of such QTVR applications on WWW.

[111] Forte, M., ibid.

[112] Forte, M., ibid.

[113] Forte, M., ibid.

[114] Forte, M., ibid.

user can interact by viewing, moving, rotating, and otherwise interacting with an apparently 3D scene. For example, it is possible to view a room and use controls to move the room as you would experience it if you were walking through it in real space."[115] The biggest advantage of VRML is that it can bring 3D and 2D information together. Many 3D modelling softwares may produce animations in the form of VRMLs.

Just as much as these languages are used, new softwares are being developed by many institutions which can provide better "realism", automated modelling, more immersive scenes and so on.

2.4 Development of Criteria for the Assessment of Presentation of Classical Archaeological Sites in VE

A presentation tries to tell the story of a site, explain its significance by bringing forth its authenticity and values.

As stated before, archaeological heritage attracts different groups of people as professionals, decision makers and touristic visitors. Each group prioritizes the intrinsic values of the site differently. Thus, the presentation for each group varies. For example, the professionals may usually be interested in the documentary values of a site. The VE presentation is generally utilized as a scientific exercise to debate the issues of academic interpretation of observations and gathered data. The "picture" displayed may not be a wholistic one but rather focus on a detail. Whereas for decision makers the economic values of a site may be important. Then, the VE presentation has to display the potential of the site to develop itself, the local environment and perhaps the nation.

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[115] Forte, M., ibid.

As for presentations of the broader audience, the display has a number of aims from conservation point of view:

The most important one is education. The didactic value of the archaeological heritage is undebatable and it is utilized as a tool to learn from the "past". Through VE this characteristic is reinforced by adding narrative contexts to purely visual material.

The second aim is raising an interest in the past. Interest brings curiosity and people tend to get more information about archaeological heritage. In return, this knowledge may create or involve an understanding of why these sites should be protected. So the presentation may promote conservation conciousness, too. Here, VE helps to integrate different components of reality to tell what reality is, in other words explain the story of the archaeological heritage.

The last purpose is perhaps the most important from conservation point of view: VE presentations give the opportunity of eliminating physical reconstructions that disturb the settings to a great extent. Only preventive conservation measures may be necessary in archaeological sites, so the authenticity and values are preserved.

Although these purposes form a common ground of the VE presentations for the broader audience, not a single pair of displays is identical. There are as many presentations as the number of archaeological sites. And even within the same group of visitors each individual undertakes the visit with his/her own set of expectations based on prior experience, immediate disposition and needs. "Most visitors to a cultural heritage site come for a day out, a change of scene, or so that they can tell their folks back home. Some come because they are interested in their cultural heritage, archaeology or architecture."[116] It is recognized that visitors arriving as members of commercial tour groups seldom appear to

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[116] Feilden, B. M., 1993, "Conservation and Tourism", *Cultural Tourism- Icomos 10th General Assembly*, Icomos, Sri Lanka, p. 60.

appreciate a heritage site as much as independent visitors. In part, this may be because independent visitors are free to take their own tour, to stroll around as they like.[117] Thus, the VE presentation of a site should be flexible enough to serve both for the interested visitors and the others which constitute the majority.

Flexibility should also be existent in the presentation language. If the archaeological site has or aims to have a certain amount of international audience then the VE presentation must be multilingual, too.

Archaeological site managers often produce perfectly photo-realistic images which can be devoured at once. This is also valid for the internet to attract users while they are surfing on the WWW. Such images help to capture the appreciation of even the least interested audience. Some scholars claim that when virtual reconstructions become indistinguishable from photographs they run the risk of being perceived as "true" end-products (especially for the broader audience) rather than an ongoing dialogue for study. Because, there is a cultural conditioning that photographs represent reality.[118] The audience should be aware that a VE presentation displays an interpretation in a predefined scenario. That is why a virtual presentation can not replace the physical experiencing of the archaeological site. In our opinion the problem is that few VE presentations give the clues of what is original and what is hypothetical in the scheme.[119]

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[117] Laws, E., 1998, "Conceptualizing visitor satisfaction management in heritage settings: an exploratory blueprinting analysis of Leeds Castle, Kent", *Tourism Management,* Volume 19, No. 6, p. 546.

[118] Gillings, M., ibid; Barcelo, J. A., ibid; Ogleby, C., ibid.

[119] "Interpretation of a cultural heritage site should always clearly identify additional interpretive interventions", quoted from "Icomos Ename Charter for the Interpretation of Cultural Heritage Sites, Second Draft, 24 June 2004", Icomos, http://www.icomos.org/icahm/enamecharter.pdf, accessed on 08 January 2005. For an example see the Jerusalem Archaeological Park Project which provides a transparent process on the production of VE presentation, at http://www.archpark.org.il, accessed on 20 February 2005. Another example is the Computer- Visualistik- Raum. See Freudenberg, B. et al, 2001, "The Computer- Visualistik- Raum: Veritable and Inexpensive Presentation of a Virtual Reconstruction", *Proceedings of the 2001 Conference on Virtual Reality,*

The hierarchical levels of information (from the most reliable to the least as traces on the building, comparative study, architectural or archaeological necessity etc) should be presented to assess the credibility of the displayed.[120] Any attribute or component of the presentation should be simulated as an independent entity with specific relations, history and physical conditions.[121] Truthfulness[122] of the VE presentation turns it into a document of the archaeological heritage itself, as it conveys all the inherent values of the heritage, it becomes a reference for authenticity. Only then, can the VE presentation be considered as an educative tool. If this is done, one may feel free to modify the model while the discussions reveal alternative proposals, too.

The levels of information can be presented on the same type of image but in different scenes. Otherwise, the story becomes a mess for the non-professional audience. For this aim, augmented reality[123] and real time

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Archaeology and Cultural Heritage, Glyfada- Greece, ACM Press, pp. 97-102; Strotthotte, T. et al, 1999, "Visualizing Uncertainty in Virtual Reconstructions", *Proceedings of Electronic Imaging & Visual Arts, EVA Europe '99,* Berlin, pp. 15- 17; Strotthotte, T., 1999, "Visualizing Knowledge about Virtual Reconstructions of Ancient Architecture", *Proceedings Computer Graphics International, Los Alamitos,* IEEE Computer Graphics Society, California*,* pp. 36-43.

[120] The creation of a finished perfect image is rightly termed as "misleading accuracy" by Alan Chalmers. As a computer scientist working in close collaboration with the archaeologists, he states the necessity of avoiding this situation. See Chalmers, A. et al., "An Interactive Photo-Realistic Visualisation System for Archaeological Sites", University of Bristol, http://www.cs.bris.ac.uk/~alan/Arch/INSITE/research/comvis/insite2.htm, accessed on 25 January 2005.

[121] Quintero, M. S., 2003, "The Use of Three Dimensional Techniques of Documentation and Dissemination in Studying Built Heritage", Unpublished PhD Thesis submitted to the Lemaire Conservation Center of the Catholic University of Leuven, Leuven, p. 25.

[122] ".....within each culture, recognition be accorded to the specific nature of its heritage values and the credibility and truthfulness of related information sources", quoted from the Document of Nara in Madran, E. & Özgönül, N., ibid.

[123] "Augmented reality is defined as the simultaneous acquisition of supplemental virtual data about the real world while navigating around a physical reality", quoted from Barcelo, J. A., 2000, "Virtual Museums. When Heritage Does Not Exist", http://www.ace.hu/tudvil/barceloe.html, accessed on 07 January 2005.

rendered images can be used. Such applications combine the images of the real world with computer generated imagery.[124] The remains can be distinguished from the interpreted parts easily and experiencing is almost through the five senses.

Availability of alternative stories for the same archaeological site is a must. Because this helps to eliminate the disadvantage of VE as an abstract world on its own. Moreover, it encourages the audience to experience the site with their own point of view. It shows that a certain "true" definition of a site does not exist but as many interpreted definitions as the number of visitors are available. This attitude may provide a quick tour (depending on the most probable scenario) for the tourist groups in hurry, while interested visitors can discover more by unfolding the certain levels of information step by step by taking their time.

Most of the time archaeological sites can only be utilized for educational purposes and presentation is the main server for this purpose. This didactive characteristic is reinforced to a great extent if the presentation is interactive.[125] Maurizio Forte proposes different levels of interactivity for the VE presentations.[126] The rate of learning increases with the rise of interactivity.

VE presentations can sometimes become a surrogate of reality in the projects. Thus, perhaps it is timely to discuss the "authenticity" of VE presentations here. Authenticity is a multi layered concept as stated in the

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[124] See Ename 974 and ArcheoGuide Projects above.

[125] Veverka, J., "Tips and Concepts for Planning Truly Interpretive Exhibits", www.heritageinterp.com, accessed on 20 February 2005.

[126] Real time 3D with rendering and texturing of surfaces, walkthrough (maximum interactivity) $\Rightarrow$ Real time 3D wire frame, transparent model, without rendering $\Rightarrow$ Real time 2D- pseudo 3D non immersive, photographic $\Rightarrow$ Real time 2D, multimedia $\Rightarrow$ Computer graphic 3D and passive animation (minimum interactivity) , quoted from Forte, M., "About virtual archaeology: disorders, cognitive interactions and virtuality", http://www.mmi.unimaas.nl/eculturenet/publicPDF/VRarcheo.pdf, accessed on 07 April 2004.

Nara Document; it ".... may be linked to the worth of a great variety of sources of information. Aspects of these sources may include form and design, materials and substance, use and function, traditions and techniques, location and setting, spirit and feeling, and other internal and external aspects of information sources".[127] To assess whether VE presentations are genuine, one has to look at the different layers that constitute the authenticity.

In our opinion as an information source virtual presentations evaluate the authenticity of archaeological heritage and finally become representitives of it. Yet, they are considered far from being authentic by archaeologists like Gillings and Barcelo.[128] The argument rises from the idea that in VE a structural model attempts to represent a real structure rather than merely its appearance. But, the high level of abstraction makes this impossible. The criticism may hold true for the earlier representations due to technological constraints. For example, one can frequently encounter perfectly cylindirical columns instead of deformed and decayed stone blocks. However, today, it is possible to capture the exact geometry of any archaeological feature down to the minutest detail and dress it with the original texture/ appearance. Recent examples also contain abstractions[129] but the presentations are a better surrogate of the real because they are capable of displaying the "imperfect". Thus, different dimensions of

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[127] Madran, E. & Özgönül, N. (eds), 1999, "Document of Nara", *International Documents Regarding the Preservation of Cultural and Natural Heritage,* METU Faculty of Architecture Press, Ankara, p. 504.

[128] Gillings, M., 1997, "Engaging Place: a Framework for the Integration and Realisation of Virtual-Reality Approaches in Archaeology", *Archaeology in the Age of Internet: Proceedings of the 25th Anniversary Conference of the CAA, Birmingham, April 1997*, Proceedings CD/990217_1532/gillin/GILLIN.htm; Barcelo, J. A., 2000, "Virtual Museums When Heritage Does Not Exist", http://www.ace.hu/tudvil/barceloe.html, accessed on 07 January 2005.

[129] See Section 2.4 for the removal of redundant data or noise from initially acquired data.

authenticity like form, design, material, substance, techniques, function and setting are captured by VE.

Again, the criticized lack of certain aspects in earlier examples, like spiritual, social and other contexts are included within today's VE presentations. It must be kept in mind that such issues can almost never be reflected in physical reality for the people that created these contexts have long disappeared from the archaeological sites. One can understand the logic behind a virtual ritual in an Apollo Temple or feel the vibrant crowd in a virtual agora but hardly grasp the same spirit on site without guidance. The inclusion of these aspects is important to trigger the imagination of the audience, too.

If certain aspects like form and design, materials and substance, use and function, traditions and techniques, location and setting, spirit and feeling constitute the horizontal dimensions of authenticity, then time aspect becomes the vertical dimension. Because authenticity embraces all the stratification of cultural heritage without giving priority to any period. Thus, interpretation of archaeological heritage should "clearly distinguish and date the successive phases in its evolution".[130] VE presentations are capable of handling such a challenge.

Looking from this perspective, the VE presentations hold more layers of authenticity than today's physical reality. However, instead of claiming they are more authentic than physical reality we may propose that VE presentations reflect the authenticity of the archaeological heritage. They should help to enhance the experiencing of sites but can not become a substitute for this experience.

VE presentations offer a more integrated picture of the archaeological heritage when compared to physical reconstructions. This is

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[130] "Icomos Ename Charter For the Interpretation of Cultural Heritage Sites, Second Draft, 24 June 2004", Icomos, http://www.icomos.org/icahm/enamecharter.pdf, accessed on 08 January 2005.

made possible by minimum intervention to the sites themselves. Thus, we may argue that VE can completely rule out the physical reconstructions which destroy the authenticity and values of the archaeological heritage. During conservation decision making, especially at the presentation stage, this characteristic of VE should definitely be considered. And virtual presentations should display the concern for conservation.

CHAPTER 3
CASE STUDY: SAGALASSOS

3.1 History of the Region and the City

Sagalassos is located in SW Turkey, near the present town of Ağlasun in Burdur, in the antique region of Pisidia, now known as the "Lake Region" (Figure 3.1.1). The town is laid on south-facing terraces at altitudes between 1450 and 1600m, on the north leaning against the 1800m high Akdağ. To the south, Sagalassos overlooks the lush, green plain around the modern town of Ağlasun and, behind some forested hills, another vast plain.[1]

Pisidia have a climate with short, hot, mainly dry summers and colder, wetter winters compared to those in the coastal regions, due to its inland position and mountainous character.[2]

The first traces of hunter/gatherers in the territory of Sagalassos goes back to the 12000 BP.[3] By the 14th century BC, the mountain site of Salawassa was mentioned in Hittite documents, possibly to be identified with the later Sagalassos. Under Phrygian and Lydian cultural impulses the town gradually developed into a regional centre. During the Persian period, Pisidia became known for its warlike and rebellious factions. In 333 BC

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[1] Waelkens, M., 1997, "Interdisciplinarity in Classical Archaeology A Case Study: The Sagalassos Archaeological Research Project (Southwest Turkey)", *Sagalassos IV Report on the Survey and Excavation Campaigns of 1994 and 1995 (Acta Archaeologica Lovaniensia Monographie 9),* Leuven University Press*,* Leuven, p. 227.

[2] Waelkens, M., ibid, p. 228.

[3] Waelkens, M., ibid, p. 231.

Alexander the Great invaded the city to integrate the region in his larger strategic scheme of conquering Persia.[4]
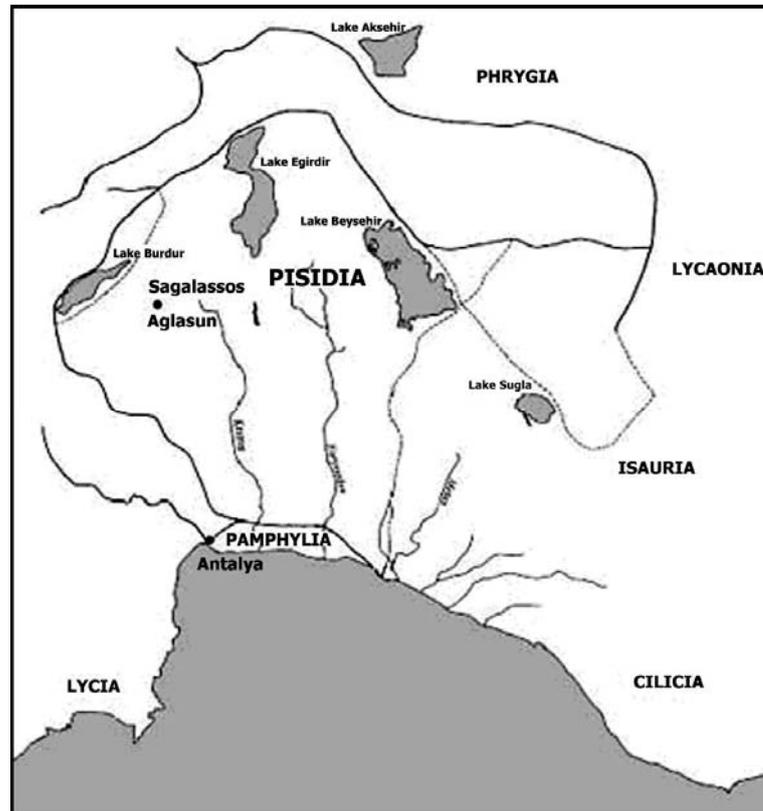
Figure 3.1.1. Location of Sagalassos.

(Base map provided by http://www.sagalassos.be/enghome.htm, accessed on 01 March 2005)

Pisidia changed hands many times among the successors of Alexander, being incorporated into the kingdom of Antigonos Monopthalmos (321-301 BC), perhaps Lysimachos of Thrace (301-281 BC), the Seleucids of Syria (281-189 BC) and the Attalids of Pergamon (189-133 BC). The use of Greek, the development of municipal institutions and the material culture

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[4] Waelkens, M., ibid, p. 225.

were the proofs of a fairly quick Hellenisation. After the Attalids bequeathed their kingdom to Rome, Pisidia became a part of different Roman provinces of Asia. In 25 BC, Rome incorporated Pisidia once and for all into its empire and created the province of Galatia. The armies of Augustus introduced the Pax Romana into the region, and this favourable climate remained unchanged for centuries. Sagalassos and its territory turned into dependable, prospering Roman partners during the 2nd century AD. The control of a fertile territory with a surplus production of grain and olives, as well as the presence of clay beds allowing an industrial production of high quality tableware ("Sagalassos red slip ware"), made the export of local products possible. Moreover, the Via Sebaste linked Sagalassos to the Mediterranean port of Perge, too. Rapidly, under Roman Imperial rule, Sagalassos became the metropolis of Pisidia.[5]

Trouble started around 400 AD, when the town had to experience Isaurian attacks. Yet, Sagalassos could remain rather prosperous even under these conditions, and though it had received a serious blow by an earthquake in 518 AD, it was restored again. During the 5th century Christianity dominated. Sagalassos became the second most important bishopric of Pisidia.

The eventual decline was created by the plague of AD 541-542, which wiped out half of the population. The last inhabitants finally abandoned the civic centre around the middle of the 7th century AD, when the socio-economic network of the town was shattered by another major earthquake, new epidemics and the first Arab raids.[6] So a massive erosion covered the ruins of the abandoned city.

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[5] Waelkens, M., ibid, p. 242.

[6] Waelkens, M., 1995, "The 1993 Survey in the District South and East of Sagalassos", *Sagalassos III (Acta Archaeologica Lovaniensia Monographie 7),* Leuven University Press, Leuven, p. 13.

By the 13th century AD the town entirely disappeared from written records. The fairly remote location of the site on high mountain terraces disabled the systematic dismantling of its monuments for building materials. The rapid burial of the urban remains under extensive erosional deposits not only obscured the ruins from sight but also protected them. As a result, Sagalassos offered a potential for archaeological research programmes.

3.2 Urban Development

The oldest architectural remains in Sagalassos are from the Hellenistic Period which signifies the time between 333- 25 BC for this city peculiarly.

Many sepulchral monuments are preserved from the early Hellenistic period as well as the Market Building of 3rd century BC, on the Upper Agora, which contained storage facilities (food, water, oil) (Figure 3.2.1 & 3.2.3).[7]

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[7] Waelkens, M., 1999, *Sagalassos Booklet*, TC Başbakanlık Tanıtma Fonu Kurulu, Ankara, p. 8.

Figure 3.2.1. The Market Building on the east edge of the Upper Agora (Waelkens, M., 1999, *Sagalassos Booklet*, TC Başbakanlık Tanıtma Fonu Kurulu, Ankara, p. 8).

The Attalid influence of Pergamon, officially controling the town, is visible in many artistic, architectural and urbanistic developments during the late Hellenistic period.[8]

The large, trapezoidal Upper Agora, dating back to the 2nd century BC is the first example of this impact.[9]

The Bouleuterion or the Council House (Figure 3.2.3) was built towards the end of the 2nd century BC (or at the latest near the beginning of the 1st) on a terrace overlooking the upper agora from the west.[10]

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[8] Waelkens, M., 1993, "History and Archaeology", Sagalassos I: First General Report on the Survey (1986- 1989) and Excavations (1990- 1991) (Acta Archaeologica Lovaniensia Monographie 5), Leuven University Press, Leuven, p. 42.

[9] Waelkens, M., ibid, p. 43.

[10] Waelkens, M., 1995, "The 1993 Excavations on the Upper and Lower Agora", *Sagalassos III (Acta Archaeologica Lovaniensia Monographie 7),* Leuven University Press, Leuven, p. 25.

Figure 3.2.2. The bouleuterion to the east of the Upper Agora (Waelkens, M., 1999, *Sagalassos Booklet*, TC Başbakanlık Tanıtma Fonu Kurulu, Ankara, p. 10).

At the same time, Sagalassos became a regional center of ceramics production. Thus, the Potters' Quarter was originally constructed in this era.[11]

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[11] Waelkens, M. & Peetermans, D., 2002, *Ontdekking van het verloren Sagalassos,* Leuven University Press, Leuven, p. 41- 4.
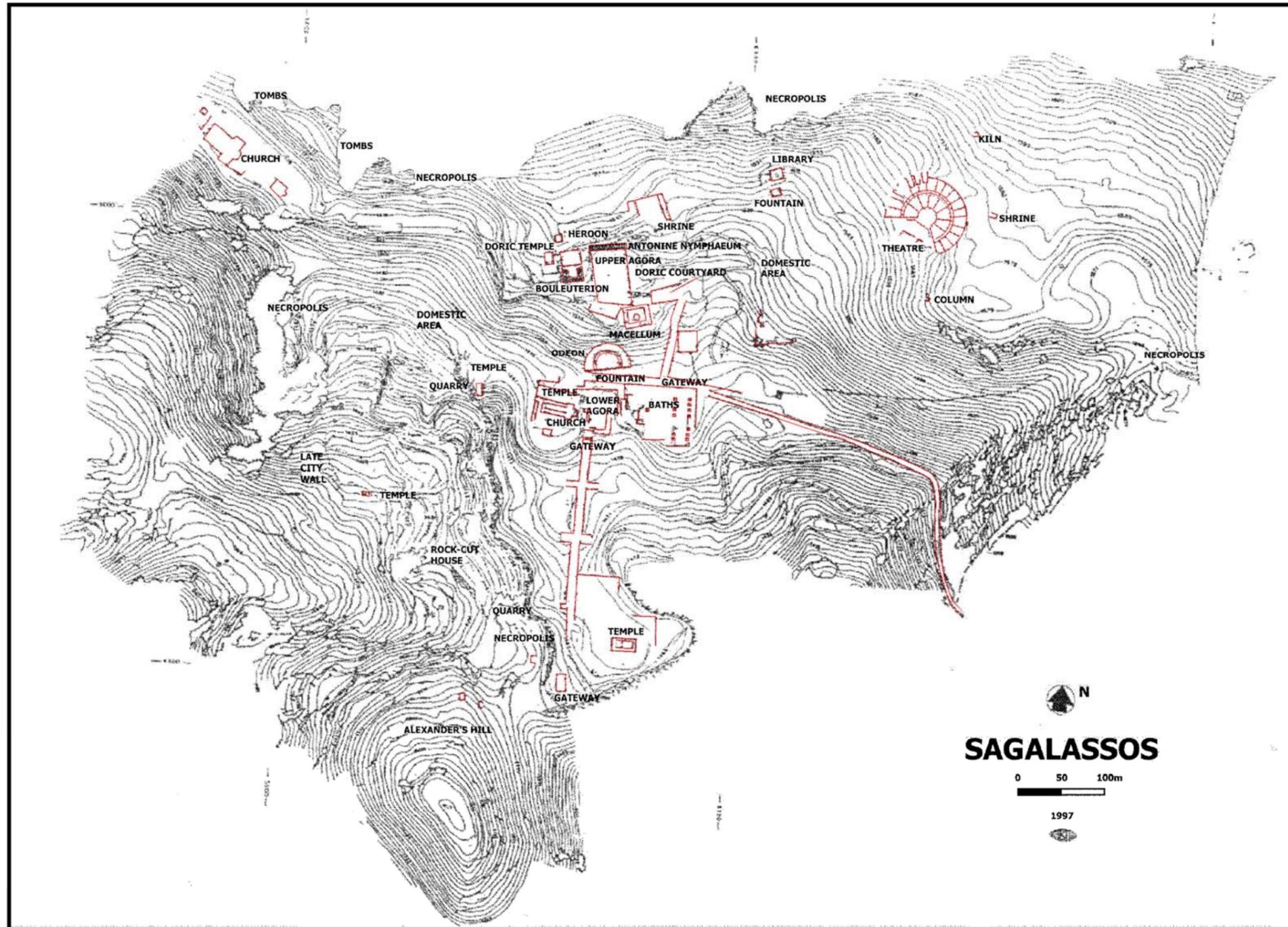
Figure 3.2.3. The map of Sagalassos (base map provided by Sagalassos Archaeological Research Project).

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The Doric Temple, dedicated to Zeus, just above the Upper Agora was most probably built during the late 1st century BC/ early Imperial Period, had been altered several times as a result of stability problems on this very steep hill (Figure 3.2.4).[12]

Figure 3.2.4. The Doric Temple from northeast and its aerial view (Waelkens, M., 1999, *Sagalassos Booklet*, TC Başbakanlık Tanıtma Fonu Kurulu, Ankara, p. 12).

The doric, late hellenistic fountain to the north-east of the city center was built during the 1st century BC (Figure 3.2.5).[13]

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[12] Waelkens, M., 1993, "The 1992 Excavation Season, A Preliminary Report", *Sagalassos II Report on the Third Excavation Campaign of 1992 (Acta Archaeologica Lovaniensia Monographie 6),* M. Waelkens & J. Poblome (eds), Leuven University Press, Leuven, p. 9.

[13] Waelkens, M., 1999, *Sagalassos Booklet,* TC Başbakanlık Tanıtma Fonu Kurulu, Ankara, p. 13.

Figure 3.2.5. The restored late hellenistic fountain house (author, August 2004).

Around 25 BC a new era started for the city as Sagalassos was incorporated to the Roman province of Galatia. Parallel to the growing prosperity, vast architectural programmes were realized in this period, which would last until 518 AD.

The on-going peace ensured the enlargement of the urban areas outside the Hellenistic city walls. The town was almost doubled in size. The streets and water- supply system was renewed and modernized.[14]

The Upper Agora was enlarged, repaved and reoriented.[15] Four Corinthian honorific columns were erected on the corners as well as a canopy shaped monument on the south and another building to the north-east of the Agora, too.

The NW Heroon located in the upper part of the monumental city center, to the NW of the Upper Agora, to the NE of the Doric Temple

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[14] Waelkens, M., 1993, ibid, p. 45.

[15] Waelkens,M., 1993, ibid.

(Figure 3.2.6), was probably built during the early Roman imperial period, particularly during the reign of Augustus (0- 14 AD). The construction seemed to have been part of a building programme to transform the area into a kind of sacred quarter along with the other smaller edifices around NW Heroon, like the NE Heroon and honorific columns.[16] The heroon was supported by an ashlar socle crowned by a moulding and the "Dancing Girls" friezes. Above this podium there was a 10.785m naiskos.

Figure 3.2.6. The Heroon from the southeast (author, July 2004).

Again around the same period, a propylon was added to the Doric Temple.[17]

Coming to the south of the city, one would find the Ionian temple of Apollo Klarios, also dedicated to the Imperial Cult, erected on a terrace west

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[16] Waelkens, M., 1993, ibid, p. 47.

[17] Waelkens, M., ibid.

of the Lower Agora. It was repaired towards the beginning of the 2nd century AD and later transformed into a church.[18]

The Tiberius Gateway on the colonnaded street opening to the Lower Agora was built during the reign of Tiberius (14- 37 AD).[19]

The Lower Agora received a brick Nymphaeum on its north side during the reign of Trajan (98- 117 AD) (Figure 3.2.7).

Figure 3.2.7. The Trajanic Nymphaeum built directly in front of the earlier brick nymphaeum (author, August 2004).

For Sagalassos, the period from the reign of Hadrian (117- 138 AD) to that of Marcus Aurelius (161- 180 AD) in particular was a fruitful one as proved by the enormous building activity of those days.[20]

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[18] Waelkens,M., 1999, *Sagalassos Booklet*, TC Başbakanlık Tanıtma Fonu Kurulu, Ankara, p. 24.

[19] Waelkens,M., 1999, *Sagalassos Booklet*, TC Başbakanlık Tanıtma Fonu Kurulu, Ankara, p. 23.

[20] Waelkens, M., 1993, "History and Archaeology", *Sagalassos I (Acta Archaeologica Lovaniensia Monographie 5)*, Leuven University Press, Leuven, p. 45.

The Neon Library was erected between 120- 130 AD by a local inhabitant with the name of T. Flavius Severianus Neon in memory of his deceased father and uncle.[21]

Around the same time a second Nymphaeum was constructed on the Lower Agora, above the older one, as well as a Dionysos Temple.

To the south of the city center, the biggest sanctuary of the town got started. Completed under the reign of Antoninus Pius (138- 161 AD) and named as such, the Temple of Antoninus Pius was also dedicated to Hadrian and Zeus, too.[22]

The tallest complex on the site, the Roman Baths originated from the same era yet it was completed under the reign of Marcus Aurelius (160- 180 AD). But its present form was dated to an extensive repair after the 518 AD earthquake. The structure had 3 floors: a vaulted floor to provide a levelled area for the bath, a hypocaustum storey and the actual bathing parts on the upmost level.

Antonine Nymphaeum (161- 180 AD) was placed along the north side of the Upper Agora whereas a Macellum was located to the south-east during the reign of Marcus Aurelius.[23]

The Roman theatre of Sagalassos was constructed around 180- 200 AD. It could seat 9000 spectators and offered a good view of the surroundings because its stage building was exceptionally only one storey high (Figure 3.2.8).[24]

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[21] Devijver, H. & Waelkens, M., 1993, "The Inscriptions of the Neon-Library of Roman Sagalassos", *Sagalassos II Report on the Third Excavation Campaign of 1992 (Acta Archaeologica Lovaniensia Monographie 6)*, Leuven University Press, Leuven, p. 109.

[22] Waelkens, M., ibid.

[23] Waelkens,M., ibid, p. 27.

[24] Waelkens,M., 1999, Sagalassos Booklet, TC Başbakanlık Tanıtma Fonu Kurulu, Ankara, p. 31.

Figure 3.2.8. The Theater of Sagalassos (author, July 2004).

Around 400 AD the Doric Temple and the NW Heroon were transformed into towers and incorporated into the city's late Roman fortification. A propylea was constructed directly next to the NW Heroon.

After that time, the city was heavily subjected to the attacks of Isaurian tribes. As a result, Sagalassians fortified their inner town and the sanctuary of the imperial cult.[25]

Various temples and other buildings were transformed into churches.[26] For example the Bouleuterion was transformed into the city's first cathedral. The old council house now became an open courtyard, whereas the former courtyard of the building was evolved into a three-aisled church. Its floor was covered with polychrome mosaics and a

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[25] Waelkens, M., 1993, "History and Archaeology", *Sagalassos I (Acta Archaeologica Lovaniensia Monographie 5),* Leuven University Press, Leuven, p. 47- 9.

[26] Waelkens,M., 1999, Sagalassos Booklet, TC Başbakanlık Tanıtma Fonu Kurulu, Ankara, p. 15.

baptistry was built into the northwest corner of the council house (Figure 3.2.9).[27]

Figure 3.2.9. The boulouterion on the left and its courtyard on the right (author, October 2004).

During 4th- 6th century AD an urban villa was erected and altered several times, in the so called Domestic Area.

Following an earthquake in 518 AD Sagalassos was restored.[28] The elite continued the same luxurious lifestyle and the area especially around the Lower Agora became the scene of monumental structures. For example, a public lavatory was added to the ground floor of the Roman Baths. But a few years later in 541 the plague hit the city. Having lost half of its

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[27] Waelkens,M., ibid, p. 37.

[28] Waelkens,M., 1999, Sagalassos Booklet, TC Başbakanlık Tanıtma Fonu Kurulu, Ankara, p. 39.

population Sagalassos could not resist another earthquake in the 7th century and so it was abandoned forever. The city was never looted in later periods.

3.3 Systematic Researches in Sagalassos

The first report on Sagalassos was published in the beginning of the 18th century AD. In the fall of 1706 the French traveller Paul Lucas passed through the ruins of the town, which he mistook for the ruins of various castles.[29] More than a century later, in 1824, the British F. Arundell deciphered the name of the site in an inscription.[30] In the following decades Sagalassos was visited by western travellers. In 1884-5 the Polish count K. Lanckoronski produced the first map of Sagalassos and recorded some of its inscriptions which were visible on the surface, but he actually never completed his survey.[31] Within the coming decades, archaeological excavations began at some sites along the coast of Asia Minor, but the interior of the country did not receive any attention.[32] Some small-scale expeditions further surveyed the remains at Sagalassos. The work of R. Fleischer in the early 1970's on the Augustan NW Heroon is the most important of these.[33] As a result, particular aspects of the town were

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[29] Lucas, P., 2004, *Troisième voyage du Sieur Paul Lucas dans le Levant : Mai 1714 - Novembre 1717*, Publications de L'Université de Saint Etienne, Paris, p. 38.

[30] Arundell, F. V. J., 1828, A Visit to the Seven Churches of Asia with an Excursion into Pisidia, London.

[31] Lanckoronski, K., 1892, *Stadte Pamphyliens und Pisidiens. II. Pisidien,* Vienna- Prague- Leipzig.

[32] Waelkens, M., 1993, "History and Archaeology", *Sagalassos I (Acta Archaeologica Lovaniensia Monographie 5),* Leuven University Press, Leuven, p. 40.

[33] Waelkens, M., ibid.

studied, but a more general approach of the urban landscape and the region of Pisidia was lacking.

Systematic exploration of Pisidia only started in 1982, with the British *Pisidia Survey Project* (Swansea College and The British Institute of Archaeology at Ankara), which aimed at studying the surface remains of all ancient sites in the region.[34] In 1985, the British team, already joined by Marc Waelkens (K.U.Leuven), paid a first visit to Sagalassos, confirming the potential for systematic archaeological research of the town and its region.[35]

During the last season of surveying at Sagalassos, in 1989, a small-scale excavation had been executed, in collaboration with the provincial Museum of Burdur. The ongoing, large-scale excavations were started in 1990 on behalf of the Catholic University of Leuven. At the same time, a systematic interdisciplinary research programme was initiated.[36]

Along with the excavations, surveying campaigns were launched in the territory of the town in 1993, to fully understand the ancient center with its associated hinterland. For Sagalassos, the territory is quite extensive (1,800 km²) including more than 250 new sites, from prehistoric to Ottoman. In the mean time, information has been gathered documenting the settlement history of the area, development of its climate, vegetation & fauna, stratigraphical deposits, the craft production and trade activities and religious practices as well as the land use and exploitation of raw materials since the Holocene. In 1998, the next phase of intensive surveying was introduced, focusing, in a first stage, on the extensively urbanized and

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[34] Waelkens, M. et al, 1997, "Interdisciplinarity in Classical Archaeology A Case Study: The Sagalassos Archaeological Research Project (Southwest Turkey)", *Sagalassos IV Report on the Survey and Excavation Campaigns of 1994 and 1995 (Acta Archaeologica Lovaniensia Monographie 9),* Leuven University Press, Leuven, p. 226.

[35] Waelkens, M., ibid.

[36] Waelkens, M., ibid.

associated suburban areas. This research is still continuing parallel to the excavation strategy.

Since the beginning of excavations the project aimed at becoming a multidisciplinary research program:

The Numismatic Center of K.U.Leuven identifies and dates all coins found at Sagalassos, reconstructs the trade patterns and coin circulation.[37]

Through the application of various geo-physical surveying techniques at the surface, the team of Geo-physical Prospection Unit of University of Ljubljana, Slovenia aims at tracing, identifying and visually reconstructing buried archaeological features, such as, for instance, street patterns and housing blocks.[38]

Virtual Archaeology, 3D Capturing and Seriation Team is a member of EPOCH (Excellence in Processing Open Cultural Heritage), a network of 86 European cultural institutions joining their efforts to integrate the currently fragmented efforts in research directed toward developing intelligent IST technologies for cultural heritage and their use for sustainable Cultural Heritage applications. Department of Education in Leiden University specializes in the development of multi-variable statistical techniques, such as constrained correspondence analysis, to the chronological seriation of assemblages of archaeological artefacts.[39]

K.U.Leuven and Akdeniz University study the epigraphical evidence produced by the ongoing excavations at Sagalassos, reconstruct the historical context of the texts and evaluate their role in the socio-political reconstruction of ancient town.[40]

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[37] Waelkens, M., Web Page of Sagalassos Archaeological Research Project, www.sagalassos.be, accessed on 25 June 2005.

[38] Waelkens, M., ibid.

[39] Waelkens, M., ibid.

[40] Waelkens, M., ibid.

Geology Laboratories of K.U.Leuven focus on the mineralogical and geo-chemical characterization of the mineral resources available (stone, metal, clays, salts) in the territory of Sagalassos, their provenancing and application in the ancient town of Sagalassos in, for instance, the local pottery, glass and metal production or the local availability of building materials (limestone, volcanic tuff, mortars). A second major topic of geological research is the reconstruction of the nature and sequence of seismic events which greatly affected the region of Sagalassos throughout the occupation history of the town and the region. The Geological Teams of Gent University determine the provenance of the different imported marble varieties in use at Sagalassos as construction material, decorative panelling and sculpture. Recently, the analysis of colouring pigments was also incorporated.[41]

Geomorphology team of K.U.Leuven is involved in the study of the origin, characteristics and evolution of the natural landscapes in and around Sagalassos. A focal point of interest is the understanding of on-site erosional events, which affected the archaeological record and therefore interpretation of the stratigraphical evidence. Within the larger territory of Sagalassos, the geomorphological research contributes to the palaeo-ecological reconstruction of the natural environment and vegetation.[42]

Cartography Team of K.U.Leuven provides topographical surveys and maps of the area of the archaeological site of Sagalassos. These maps are basic tools in interpreting the distribution of archaeological phenomena.[43]

The archaeo-zoological research team of K.U. Leuven concentrates on the systematic collection and study of all faunal remains recovered from the excavations, the study of the local dietary habits, the reconstruction of

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[41] Waelkens, M., ibid.

[42] Waelkens, M., ibid.

[43] Waelkens, M., ibid.

economical patterns of exchange and the reconstruction of the natural environment of the site and region. Recently, research topics are focussing on the practices of herding goats and sheep in the past and today, on developing techniques to distinguish sheep from goat remains, and on the reconstruction of the trade patterns of imported fish, applying for the first time DNA analysis of fossil fish bones. The team also specializes in establishing seasonality patterns in slaughtering domestic animals in the past and identifying their economic exploitation.[44]

Macro Remains Laboratory of K.U Leuven is involved in the systematic collecting and study of all fossilized floral and minuscule faunal remains, produced by the ongoing excavations, in order to redefine patterns of functional interpretation of archaeological contexts and contribute to the reconstruction of the natural environment of the ancient town and of local consumption. The research unit of Scarab Virdum of Netherlands is specialized in the determination of subfossil arthropod and entomological remains, which contributes to the characterization of the natural environment of archaeological features and structures.[45]

Residue Analysis of Ceramics Research Unit in K.U.Leuven identifies the molecular and chemical composition of lipid residues preserved on the body of ceramic vessels or within the micro-pores of the clay paste of these vessels, and contributes to the functional interpretation of archaeological deposits and artefact assemblages, as well as the the reconstruction of the natural environment and the subsistence of the site of Sagalassos.[46]

Palaeobotany (Palynology) laboratory of KU Leuven is specialized in the sampling and determination of fossilized pollen remains from the town of Sagalassos as well as from its wider territory. Pollen analysis greatly

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[44] Waelkens, M., ibid.

[45] Waelkens, M., ibid.

[46] Waelkens, M., ibid.

contributes to the large-scale and regionally based reconstruction of the evolution of the natural vegetation and climatic conditions. Another unit in Nationale Plantentuin focuses on the study of the actual vegetation patterns in the wider region of Sagalassos. The newly composed floral overview contributes to the identification and interpretation of archaeological and fossilized floral specimens. Cornell University team provides dendro-chronological dates of the charcoal samples collected during the excavations and contributes to the chronological interpretation of the archaeological deposits.[47]

Agro Engineering teams contribute to the reconstruction of the evolution of the natural environment and climatic conditions of the town of Sagalassos and its territory, as well as to the reconstruction of the agricultural tradition practised in the region of Sagalassos, which according to Livy (XXXVIII 15.9) was strikingly fertile in antiquity. In the field, different research units from Akdeniz University, Gazi University and British Institute of Archaeology provide practical assistance and exchange of data. Recently the team has set up two weather stations and a hydrological station in the area, in order to monitor the current climate and its impact on local land use.[48]

Anthropology research unit studies all skeletal human remains excavated at Sagalassos, from both inhumation and cremation contexts. The anthropological study determines the sex, age of death and cause of death of the human remains, and greatly contributes to the reconstruction of the population of ancient Sagalassos.[49]

Genetic Research Laboratory is specialized in the extraction and study of the genetic material of archaeological human remains, and

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[47] Waelkens, M., ibid.

[48] Waelkens, M., ibid.

[49] Waelkens, M., ibid.

contributes to a detailed characterization of the population of Sagalassos, their DNA-characteristics and pattern of origin and evolution.[50]

3.4 Evaluation of Presentation Methods and Their Physical Outcomings in Sagalassos

Sagalassos has always been open to the public, especially to the visits of the local people for years. But the scientific presentation studies has started simultaneously with the excavation studies, in 1990. In the recent years, as the city had risen interest, the number of visitors reached to 8000 people per month in the high season. One third of this amount is formed by the local and national tourists.

Presentation of Sagalassos to the broader public involves several aspects and different methods are utilized. These may be investigated under two categories as out of site and on site methods:

Out of site methods involve brochures, booklets or books. Recently, the Sagalassos Documentary Film has been added to this list as well.

To bring the visitors into close contact with the remains first services are provided on site. Access to the site is through an asphalt road, a parking lot is designed in front of the entrance gate. Trees provide shelters for protection against the sun & rain/ snow. Benches, sitting/ gathering/ waiting areas, toilets, souvenirs are also available for the visitors.

The primary concern of presentation involves providing information. This is achieved on site by different interventions:

- Written/ visual aids as information panels
- Observation platforms, visitor paths/ site routes
- Interventions on the remains themselves

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[50] Waelkens, M., ibid.

- Interventions related to Presentation: Replicas, Reconstructions

- Interventions related to Conservation; these are not aimed at presentation purposes but they have an impact on the display of the remains: Consolidation, Protective Sheltering, Anastylosis

On-site information panels:

These contain orthographic drawings or graphic reconstructions of the remains in addition to a descriptive text. These panels should be updated. The graphics are quite abstract and they lack several important inputs like the human factor, natural environmental context, architectural context and other intangible settings. Moreover, they represent the buildings at a certain moment in time, particularly at the time of their construction, neglecting the historical stratigraphy. This fact makes it hard for a visitor to relate the remain on site to the graphic representation as this means a huge time gap.

Visitor Paths/ Site Routes:

Three different pathways are offered to the visitors on site. The first loop is the shortest one that takes half an hour to present the city center, namely the monuments around the Lower and Upper Agora. The second loop takes an hour of walk to show the city within the fortifications. On this route the visitor is able to see not only the monuments but also the domestic areas, the necropolis, the theater and the Potters' Quarter. The third route takes almost two hours. The visitor is able to see both the city itself and its close territory. These mentioned pathways connect the single buildings to each other. However, it is difficult to talk about a unity between those structures in terms of presentation. One can not build up the relationship of the edifices, thus the character of the city be it a layman or professional.

Interventions on the remains themselves:

These can be grouped as presentation and conservation interventions. Replicas and reconstructions are purely aimed at displaying the structures whereas conservation interventions have prevention/ protection purposes. Regardless of their intention the latter have an impact on the presentation of the city, too. So it is necessary to evaluate their effects as well. The main criteria of conservation interventions are minimum intervention, if possible conservation in situ, if possible use of original construction techniques, differentiation of new interventions from original parts, the compatibiliy of old and new material, reversibility, harmony between old and new.

In Sagalassos, most of the uncovered structures are highly preserved buildings considering the amount of architectural elements. Especially the cut- stone monuments are still intact up to 80% of the totality. This fact has led the team to make reconstructions or anastylosis most of the time.

Interventions related to presentation:
Replicas:

The safe removal of the important architectural elements to the Burdur Museum is a task to be handled. In Sagalassos the conservation of remains in situ is a primary criteria. But in cases of such necessary removals casts are taken from those elements to be placed into the same location. With this method the authenticity of the material surely can not be achieved but the balance of the setting as well as the overall expression of the monuments can be protected. Such an example can be observed in the curved wall of the Lower Agora where limestone blocks with decorative reliefs are replaced with white cement casts (Figure 3.4.1). Although white cement contains less soluble salts compared to normal cement, the negative effects of this treatment should be considered. Improvement of the

presentation of the monument may result in the loss of the material itself thus nothing to present in the long run.

Figure 3.4.1. The topmost stone block bearing the relief of a deity is replaced with the white cement cast on the curved wall of the Lower Agora (author).

Reconstructions:

- The Tiberius Gateway

This roman gateway is located on the southwest corner of the Lower Agora marking the beginning of the colonnaded street. Some columns of the gateway are found in situ whereas the upper structure is mostly scattered around. For that reason a partial reconstruction of the upper structure of the gateway is realized in the Lower Agora, using the original but not in situ architectural elements (Figure 3.4.2). The reconstruction is correct in detail yet as it lacks the columns, the height is reduced. This fact makes it hard for the visitors to imagine the original appearance of the structure. Moreover the location of the isolated reconstruction makes it even

harder to relate the structure to its function. In short, the presentation of the monument is deficient though it is supported with informative panels.
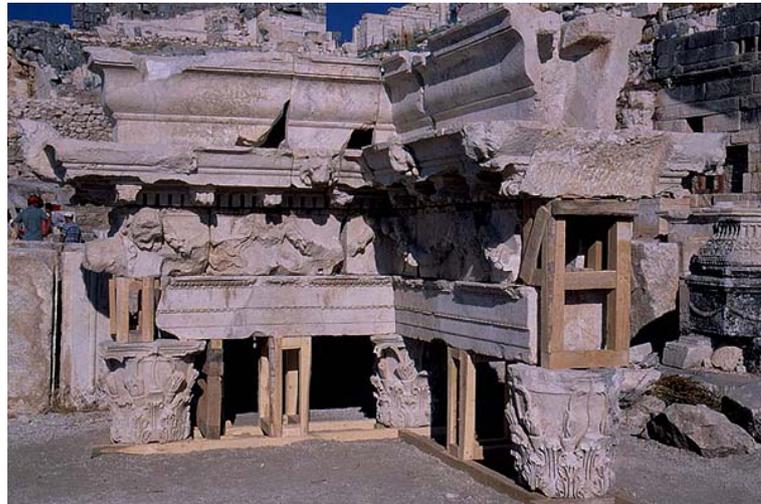
Figure 3.4.2. Partial reconstruction of the upper structure of the Tiberius Gateway (www.sagalassos.be, accessed on May 2003).

Interventions related to conservation:

Consolidation:

Where it is not possible to carry out intense conservation, the most frequent type of intervention is backfilling with geotextile covered with layers of sand, pumice and bricks/ tiles. This method effectively protects the remains from the harsh climate of Sagalassos. And it is easy to lift the protective layers for re-treatment or further study in the following seasons. However, from presentation point of view this method is neither effective nor comprehensible.

A different type of reconstruction is carried out to preserve the existing arches and vaults. The arches or vaults in Sagalassos are formed of two seperate parts: an upper and lower ring made of brick or tuff with an

infill composed of rubble stone and mortar in between. In time the outer rings disappear as opposed to the preserved infills. This fact creates structural discontinuities and the remaining part is incapable of carrying itself let alone the whole building. To overcome this problem dry brick walls are constructed underneath the arches or vaults. The topmost layer to touch the arch or vault is carefully sealed with a plastic net and finished with lime mortar. Thus the dry wall takes the shape of the arch or vault as well as the loads transferred from the upper structure. The net gives the conservator the ability to reverse the treatment with ease and dismantle the dry wall. The treatment described above creates blank brick surfaces which effect the presentation of the site negatively. But the placement of supports at particular spots as an alternative to this is far from being efficient. The other extreme is reconstruction of the arches or vaults with brick or tuff. Yet this solution is even more undesirable as it will create distracted, undesired focal points within the site. Taking the preventive measures and presenting the structures by VE seems the best solution in this case.

For the conservation of mosaics and frescoes, treatment of lacunae becomes very important. Considering mosaics, the small sections of lacunae are completed with tesserae excavated from badly damaged areas of the monuments and mortar again if the design is geometrical and known precisely. A slight distance is left between the original and new mortar (Figure 3.4.3). If the design is figural, complex or not known precisely then the lacunae is treated with mortar that has similar characteristics to the original one but slightly different in color.[51] After the preventive measures are completed, the mosaics are covered with layers of pumice, sand and geotextile. With this treatment especially the documentation value and authenticity of the material are respected. However, the presentation of the mosaics is almost impossible because preventing people from stepping on

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[51] Waelkens, M. et al., 2000, "The Sagalassos Neon Library Mosaic and Its Conservation", *Sagalassos V*, Leuven University Press, pp. 419-25.

them is a challenge. Moreover, the harsh climate does not let the mosaics to survive in the open air more than one season. Only the mosaics of the Neon Library can be displayed due to the protective shelter. But the mosaics in the courtyard of the Boulouterion, the Late Roman Villa and the Roman Baths have to stay covered. So, apart from quickly fading photographs, VE is the only way to display these mosaics and their contexts.
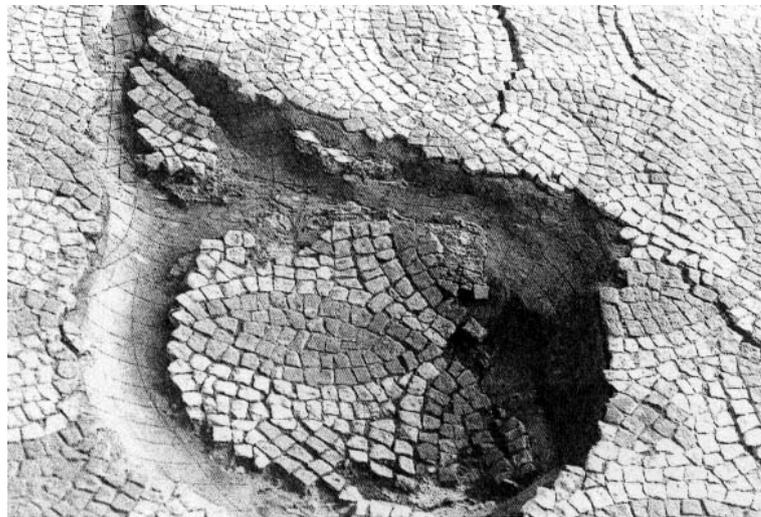
Figure 3.4.3. The deep vertical cracks of the mosaic is filled with foundation mortar,ready to be covered with compensation mortar later (Waelkens, M., 2000, *Sagalassos V*, p.428).

- Roman Baths

In the Roman Baths, the conservation of the hypocaustum system is executed simultaneously with the presentation of the remains. Here the hypocaustum columns are first consolidated then surrounded with a dry mixture of pumice, brick pieces and brick powder enclosed in a cylindrical stainless steel net. The mixture is not waterproof yet since it lets the air to pass through, the process is enough to keep the remains dry. In this method the original hypocaustum elements are not visible (Figure 3.4.4).

But the cover suggests the form and rough dimensions of the hypocaustum columns as well as the color and level of preserved material. In this case the education value of the remains is regarded above all.

This method is useful in terms of showing how a hypocaust is constructed. But the bath is composed of three different levels as the vaulted part to build up a construction terrace, the hypocaustum part and the bathing units on the uppermost level. The on-site presentation does not display the relationship of those parts. Also the bathing process, connection of spaces from apoditerium to calidarium and the bath-gymnasium connection are not clear. To explain a bathing process and the building itself VE should be utilized (Figure 3.4.5).

Figure 3.4.4. The encased hypocaustum columns (author, October 2004).
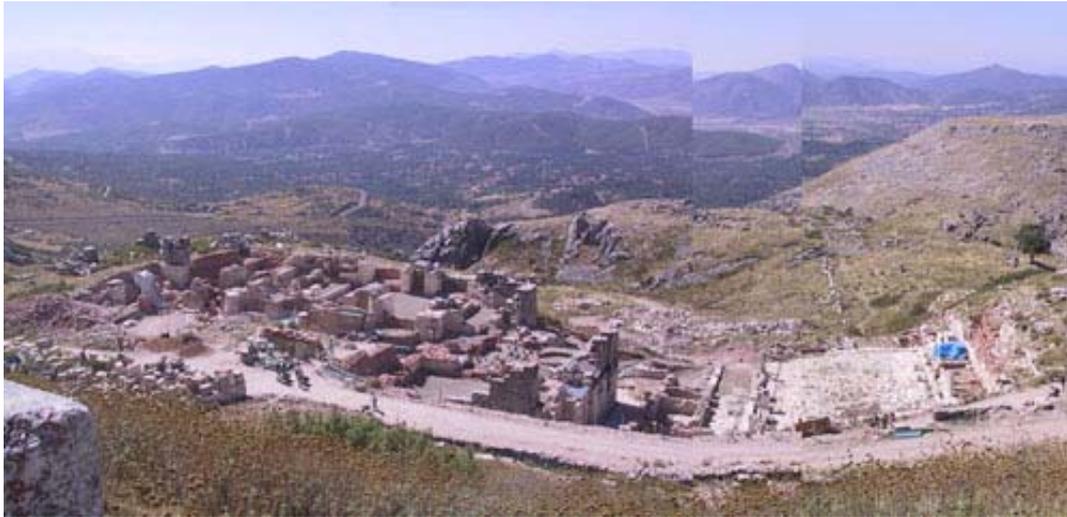
Figure 3.4.5. The Roman Baths, on the left, facing the Lower Agora, on the right (author, July 2004).

Protective Shelters:

- The Neon Library

The construction date of the Neon Library is 120- 130 AD.[52] The building is a prominent structure for Sagalassos as it hosts a mosaic floor and several important inscriptions on its interior walls (Figure 3.4.6). It is contemporary and parallel with the Celsus Library in Ephesus.[53] The structure is constructed directly behind the Late Hellenistic Fountain House, thus the street faced by the Neon Library forms the roof of the fountain house. The will to protect and present the mosaics and inscriptions in situ led to the construction of a protective shelter in 1996[54] after the excavated remains were consolidated without further completion. This shelter building is composed of limestone load bearing walls with alternating rows of bricks.

[52] Waelkens, M. et al., 1997, *Sagalassos IV*, "The 1994 and 1995 Excavation Seasons at Sagalassos", Leuven University Press, p.113.

[53] Waelkens, M. et al., 2000, *Sagalassos V*, "The Sagalassos Neon Library Mosaic and Its Conservation", Leuven University Press, p. 419-25.

[54] Waelkens, M. et al., 1997, ibid, p. 120.

The front part of the pitched roof is covered with tiles. The rest of the roof in line with the slope is intended to be covered with low plants which failed to grow due to the harsh climate. The openings of the building on the front facade is covered with timber fences for ventilation purposes as well as enabling the visitors to view the interior also from outside. Inside the building, walkways that have minimum contact with the mosaic are provided for tourist traffic and presentation. Though the material used in the construction of the shelter building is not alien to the site, the whole design seems out of scale within the remains (Figure 3.4.7). The shelter appears quite tall and bulky. The openings of the building are not enough to provide visitors different viewing angles, especially for the mosaic. These facts create problems in terms of the authenticity of the setting.

Figure 3.4.6. View of the Neon Library after the 1992 season (www.sagalassos.be, accessed on May 2003).

Figure 3.4.7. The Neon Library covered with the protective shelter building (author, October 2004).

The library is presented without its architectural and social or economic context. Neither the function of the monument nor its significance for Sagalassos and Anatolia is explained properly. Together with the fountain they suggest the existence of an urban district at this spot. But the message is obscured if the on-site presentation is not supported with other mediums.

Anastylosis:

- The Late Hellenistic Fountain

This building was constructed in the late 1st century BC.[55] It served the whole dwelling district around the theater with its modest size in the antique period. The aim of the anastylosis project was to preserve the building by using original architectural elements (of which 80% were surviving) in their original positions and structural behaviours as well as refunctioning the edifice as a fountain again.[56] The project was completed

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[55] Waelkens, M., 2000, *Sagalassos V*, "The 1996 and 1997 Excavation seasons at Sagalassos", p. 312.

[56] Patricio, T. et al, 2000, *Sagalassos V*, "Restoration of the Late Hellenistic Fountain House: Field Works", p. 399.

in 1997. Today the monument is perhaps the only example in Anatolia which is still used with its original function and original antique water source. The fountain house is built within the slope, thus it is not visible until one reaches the building (Figure 3.4.8). In that sense, it may be considered as a respectful building for the setting.

The original construction technique of the building is used in the project except for the replacement of the iron clamps and dowels with fiberglass armatures.[57] The other materials used for the anastylosis like epoxy resins and limestone powder are also reversible. Broken or missing parts are completed with limestone. The new interventions are distinguished from the original with the help of small lead seals bearing the date of restoration. Thus, the authenticity of the material, workmanship and design as well as the values is regarded through the project, too (Figure 3.4.9).

This late Hellenistic fountain is a common example among its contemporary associates. Yet the anastylosis is educative because it shows how an ancient fountain works. Moreover, it serves as a refreshing spot for the visitors on the way from the Upper Agora to the Theater.

This intervention promotes conservation conciousness because it is a succesful one. Yet, from presentation point of view, there are some deficiencies. The anastylosis helps to understand the scale of the building. But the dwelling district, that the fountain had once served, is under the soil now. So the fountain is presented without its context. Today the building looks as free standing on a deserted district on the borders of the city center. To display a complete picture of the domestic area and the fountain, another method should be used.

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[57] Ercan, S. et al., 1997, *Sagalassos IV*, "The Structural Restoration of the Late Hellenistic Nymphaeum: Principles, Laboratory Tests and Field Applications", pp. 423-37.

Figure 3.4.8. The Late Hellenistic Fountain House (on the right) built into the slope is hardly visible, on the left is the building which shelters the Neon Library and in the background the theater is seen (author, August 2004).

Figure 3.4.9. The Late Hellenistic Fountain House with the Neon Library in the background (author).

- The Antonine Nymphaeum

The nymphaeum on the political center of the city (Upper Agora) was constructed between 161-180 AD. The anastylosis project of the monument started in 1996 with the aim to conserve and function the building as a nymphaeum again with its original water source. Another reason was the level of preserved material; 80% of the building fragments existed where this percentage reached 95% for the upper structure.

The inevitable loss of the balance of the setting on the Upper Agora and consequently the city due to the anastylosis project was considered from the very start. Together with the anastylosis project of the Heroon it was aimed to be an intentional focal point within the archaeological site as they would help to improve the readability of the monumental city center. Moreover, this point of attraction could be used in favour of the presentation of the site: To reach the Upper Agora, thus the Antonine Nymphaeum and the Heroon, one has to walk through the whole city, among important monuments which enables any visitor to experience at least 80% of the entire city.

Different types of stones are used to complete broken or missing architectural elements in the anastylosis of the nymphaeum. Completion is only justified if it is based on the necessity to ensure structural stability (Figure 3.4.10). Aesthetic completions are only allowed in relation to structural completions. The carved parts are joined with epoxy and marble powder, secured by fiberglass rods. This mixture has similar properties like the limestone but it is more brittle. So in case of an earthquake it brakes from the joining surface before the stone block itself.

Figure 3.4.10. The completed limestone architrave of the nymphaeum with marble (author, October 2004).[58]

Up to this point all the interventions may be considered as respecting the intrinsic values of the monument as well as its authenticity (Figure 3.4.11). But proposals are being prepared to make the building resistant to big earthquakes. In our opininon this proposal requires a lot of intervention to the material, workmanship and design of the structure. Putting such a criteria on that building is the total ignorance of its design intent.[59] So we think that one should avoid giving heavy responsibilities to this antique structure.

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[58] Normally same type of stone is used for completions but in this case only contemporary marble could match the properties of the finely crystallized antique limestone.

[59] A striking but unfortunate example to this case is the Celsus Library in Ephesos. See Strocka, V. M., 1979, *Belleten*, "Efes'teki Celsus Kitaplığı Onarım Çalışmaları", Volume 43, pp. 818-21.

Figure 3.4.11. The Antonine Nypmhaeum in its preliminary reconstruction phase after the 2004 season (author).

The anastylosis project of the Antonine Nymphaeum is a striking example of conservation in an archaeological site. It encourages the public to promote preservation activities. It helps to create the scale of an agora which is the political center of a city. But as it is today, the building attracts a lot of attention. The balance of the setting is disturbed. The relationship of the nymphaeum with the other monuments is not clear. And the graphical reconstructions displayed on the panels do not help to draw the context.

- Heroon

This monumental tomb was constructed in the 1st century AD, in the Augustan Period. According to the studies carried out, Heroon proved to be a prominent example both for Sagalassos and Anatolia, due to its construction technique as each stone block had 4 horizontal and 3 vertical connections. It served clues for the Romanization process of Pisidia with its architectural style and decoration, too. It had been a part of the political

center of the city among many other monuments. 80 % of its architectural features were preserved. And it was discussed that the erection of the monument would not create a wrong focal point, on the contrary, it would help to make the architecture and the scale of the monumental city center readable. So the restoration project for the building started in 1999. The project will be finished in 2006.

The anastylosis project of Heroon proved very useful from education point of view as it offered unique construction details. These had been studied by many scholars and would be presented to the public at a certain level of information, too. The historical stratigraphy of the monument and surroundings also provided an integrated picture of how a monument started its life and had been modified over the centuries. Yet, the physical interventions seem short of explaining why such a religious and personal monument is constructed at this particular location of the town, next to the political center, facing the Temple of Zeus. Nor can the intangible function of the building be created. The graphical reconstructions show the original appearance of the building (although these need updating). But it should be made clear why the actual building on site looks "unfinished" and a copy of what we see on the panel can not be reconsructed. In other words, it should be underlined that a restitution project does not equalize to a restoration project, especially in a classical archaeological site. For all these reasons, VE should be utilized to get rid of the deficiencies in the presentation (Figure 3.4.12).

Figure 3.4.12. The Heroon from the south-east after the 2004 season, in the foreground the information panel is seen which is not up to date (author, October 2004).

3.5 Discussion of the Presentation of Sagalassos in VE

3.5.1 Evaluation of the Documentary Film of Sagalassos by Axell Communication

The 52 minutes documentary film of Sagalassos, released in 2003, is a production of Axell Communication in collaboration with Sagalassos Archaeological Research Project of Katholieke Universiteit Leuven (KUL), the VRT (Flemish Belgian Television), Company NECKERMANN, Ministry of Tourism of Turkey, with the support of the program PROMIMAGE, DGTRE

Ministry for the Walloon Area and Department Visics, ESAT, K.U. Leuven.[60] It is directed by Philippe Axell and has won nine different prizes all around the world for promoting and presenting archaeology.[61]

The film was shot between 1990 - 2001. Since the beginning of excavations in 1990 until 1997, each year one video footage was taken. In 2000 and 2001, three more video footages were taken. Yet, to complete the virtual reconstruction of the ancient city in 3D synthesized images, two more years of work was necessary under the supervision of the archaeologists. So the film covered twelve years of multi-field excavations.[62]

The end product is a combination of video images of the city, in situ interviews with the staff, special effects and dynamic synthesized 3D images, especially virtual reconstructions.[63] Sophisticated audio-visual techniques bring the explanations of the scientists and archaeologists into life. Instead of long explanations, the visual aspect of the film is promoted. For the virtual reconstructions, "compositing" technique is utilized.[64]

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[60] From the official website of Axell Communication on Sagalassos Documentary Film, http://www.sagalassos.com, accessed on 28 May 2005.

[61] Great Prize at Agon, in the 5th International Festival of Mediterranean Archaeological Films in Athens 2004; the Prize of the Public and the Special Mention for best development of an archeological site by ICRONOS, in the 9th International Festival of Archaeological Film of Bordeaux 2004; 3 Special Mentions in the categories Better Film, Better Special Effects, Appreciation of the Public, The Archaeology Channel, International Film and Video Festival - Eugene (Oregon) 2004 - U.S.A; Price of the Public and Price of Best Film on Archaeological Excavations, Cinarchea - International Festival of the Archaeological Films - Kiel 2004 – Germany; Price of the Public, Festival of the Archaeological Films "Valle dei templi"- Agrigento 2004 – Italy; Price of the Public and Price of Archaeology, Kineon, International Festival of Archaeology Films, Brussels 2003 – Belgium; 2nd Place at the Classification of the Public International Gathering of the Archaeology Films - Roveretto 2003 – Italy, Great Price, International Festival of the Archaeological Films - Nyon 2003 – Switzerland; quoted from the website of Axell Communication, ibid.

[62] Website of Axell Communication, ibid.

[63] Website of Axell Communication, ibid.

[64] "In visual effect post- production, compositing refers to creating complex images or moving images by combining images from different sources- such as real- world digital video, digitized film, synthetic 3D imagery, 2D animations, painted backdrops, digital still

Virtual reconstruction of Sagalassos and its principal buildings, by 3D data-processing technologies, is one of the objectives for using special effects in this film. Augmented Reality makes it possible to reconstitute the destroyed monuments on their original site and to integrate them in real sequences comprising of the movements of camera.[65] The primary 3D modelling softwares, ShapeWare and ShapeVideo, are provided by ESAT of KU Leuven. The accuracy of the software is tested in the laboratory in comparison to on-site measurements, too. [66]

The film is generally aimed at the broader audience though at a certain level it hopes to evoke some academic debate as well.[67]

Our evaluation aims to focus on the virtual presentation of Sagalassos but the film blends real video sequences with virtual 3D reconstructions. Because the scenario unfolds as a whole, the evaluation obligingly covers the totality.

The documentary is quite didactic as it sheds light on how a multidisciplinary archaeological research project is carried out. Many questions are answered like why Sagalassos is chosen, how it is excavated, documented, interpreted, conserved, presented and certain assumptions by various disciplines are checked. It is underlined that an archaeological project takes years. The main aim is not digging but collecting scientific information including environmental, economic and social aspects. To be sure, one has to excavate, survey, study and interpret the gathered data

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photographs and text", quoted from Wikipedia, http://en.wikipedia.org/wiki/Compositing, accessed on 03 January 2005.

[65] Website of Axell Communication, ibid.

[66] "The generated 3D models are accurate enough to provide measurements for planning conservation or restoration work. Another goal of the softwares is to allow for virtual reconstructions before a real reconstruction is attempted on site. This is made possible by modeling every stone of a ruin", quoted from Pollefeys, M. et al, "Virtualizing Archaeological Sites", http://www.virtualheritage.net, accessed on 10 May 2003.

[67] Narrating Prof. Marc Waelkens.

over many seasons. Yet, most of the time, the conclusions are just probabilities, not certain facts.[68]

The DVD film of Sagalassos explains the location of the city as well as its evolution over the centuries or historical stratigraphy; its development from Hellenistic into Byzantine Period, its decline in the 7th century, its rediscovery by the 18th and 19th century travellers and the starting of the archaeological research project in the recent years (Figure 3.5.1.1). The story is told by merely using important monuments, particularly the ones that have been excavated and conserved. Yet, we have a lot of information about the urban layout of the city both over and under the ground like the transportation/ street, sewage and drainage network, dwelling districts, necropolis, fortifications, artisanal (ceramic, bone, iron, copper) or agricultural (mills) production quarters, earthquake fault lines in the territory etc. This information is gathered through the studies of various disciplines.

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[68] Website of Axell Communication, ibid.

Figure 3.5.1.1. The history of the city over the centuries until today (Sagalassos Documentary Film, 2003, Axell Company).

One of the primary goals of the film is to reflect the values and authenticity of this ancient site. For this reason, many monuments are described in detail covering their material, construction techniques, designs and architectural contexts. However, some deficiencies exist in explaining the authenticity of the city:

A common problem of the whole presentation is the lack of virtual human models. The town looks as if a ghost city. But we know that Sagalassos was a crowded town full of life. The presentation lacks the social

context of the monuments. Thus, the most important aspect of Sagalassos that created the city is excluded. This situation completely rules out the possibility to grasp the intangible context of the monuments, too.

Extensive paleobotanical and archaeozoological studies are carried out in Sagalassos. The landscape of the town and its environs as well as the agricultural products being raised or imported throughout the centuries is well known. Again we have a lot of information about the fauna of the Sagalassos territory (including both wild and domestic animals) up to the level of defining the daily diet of the Sagalassians and the type of meat being consumed. However, such information barely find a place in the VE presentation: The film opens with a sequence showing Sagalassos before a forest. As we approach we realize that this forest is composed of pine trees that are extinct today. But the audience is not made aware of this fact.

The time aspect or historical stratigraphy is not regarded in the story of some of the important monuments, which are extensively altered through the centuries. Such monuments like the Heroon or the Antonine Nyphaeum will be discussed below.

By the use of augmented reality, the physical reality (or remains) is distinguished from the interpreted (virtual) parts. Virtual reconstructions have to be built upon the video footage taken from real physical remains, thus match these in scale. For this reason, the abstraction is kept at a minimum level. The assembly and the writing of the comments were also carried out in close cooperation with Professor Waelkens and his team in order to guarantee the scientific validity of film.[69] Yet, the presentation is not transparent enough considering the preparation process of the virtual reconstructions. Hierarchical levels of knowledge should be presented in order to assess the credibility of the displayed. However, this does not have to be in the same screen with the general scenario.

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[69] Website of Axell Communication, ibid.

The film is not flexible in terms of providing different choices of presentation. It narrates only one story for the city which particularly highlights the monuments as we have mentioned above. The audience is just informed about these prominent structures thus the virtual site experience is incomplete. If we consider that even for sightseeing three different routes are offered on site in Sagalassos, the same approach should be followed for the virtual tour of the city and different alternatives should be presented, too.

The dubbing is in English and French. But Turkish should also be included as Turkey is the hosting country for this archaeological project. At least subtitles should be provided for the Turkish audience.

The lack of interactivity within the virtual presentation decreases the level of learning to lower rates. The documentary is long, it is hard to remember all of the story and avoid getting confused. To unite the experience with the didactic story and leave traces of information, a reinforcement is necessary.

The documentary raises an interest in the past because it helps to illustrate the formation, development and transformation of such a civilized ancient city on top of a mountain. It presents the site and the buildings in a contextual totality, which can not be achieved in physical reality. As the authenticity and the values of the ancient city are conveyed, the consciousness to protect such an archaeological heritage is created naturally.

The VE presentation on the DVD underlines the importance of conservation studies, explains different treatments for conservation and tries to raise a consciousness. The film tells that when a building is completely uncovered, it is studied for seasons meanwhile preventive conservation measures are executed. After those studies, the decision is taken whether to restore it or not. Because the heritage should be left to future generations both for scientific and cultural reasons. This

consciousness is promoted through different preservation attempts in Sagalassos:

The Late Hellenistic Fountain is explained according to its historical stratigraphy and its importance is stressed as the starting point of the entire water distribution system of the city. First the original appearance of the building is shown, in its original architectural context, namely the dwelling district of the Late Hellenistic Period. This is a critical issue because the physical restoration and on-site panels are not capable of providing the contextual information. In VE, the monument is traced over the centuries, finally seen at the beginning of its excavation. The script explains how it was realized, why it was dug and the rate of preserved material. Waelkens stresses the importance of academic research as well as conserving the unearthed archaeological material. The VE presentation highlights the faithfulness of restoration to authenticity both in terms of the authenticity of material, design, technique and the use of original water supply and drainage. Each element is used in its original location, because this is the best way to preserve the structure. Professor explains how new interventions are shown to the public by the help of dated lead seals. So, the story does not only underline the necessity of protecting an archaeological site but also presents the principles for preservation (Figure 3.5.1.2).

Figure 3.5.1.2. The sequences showing the historical stratigraphy of the Late Hellenistic Fountain, from the time of its construction until its excavation and restoration (Sagalassos Documentary Film, 2003, Axell Company).

The Neon Library is also explained according to its historical stratigraphy. Its original architectural context is shown with the Late Hellenistic Fountain. The interpretation is told in comparison to Celsus Library of Ephesus, that Sagalassos monument is built a few years later than the former, with the same intentions as a memorial and similarities exist in the architectural style. M. Waelkens tells the importance of the mosaic that the monument hosts. This is the reason why a protective building was constructed over the ruins. As we do not have enough information about the upper structure of the building, it is virtually reconstructed only as a mass but the details are excluded (Figure 3.5.1.3).

Here, a big question remains about the functioning of the building. In our opininion, the VE presentation could have displayed the use of the library and its relationship with the nearby Upper Agora in the Hellenistic

period. This would have also shed light on similar examples in Anatolia like the ancient Library in Pergamon.

Figure 3.5.1.3. The Neon Library through the centuries until the time of its restoration (Sagalassos Documentary Film, 2003, Axell Company).

The conservation of statues and small finds and their removal to Burdur Museum is also explained in the film. Half of the Burdur Museum collection is from Sagalassos. Not a single piece from the excavation leaves Turkey. Here VE helps to put those finds into their original contexts. By that

way, the audience is made aware of their value, the life they once belonged to and the period they signify (Figure 3.5.1.4).
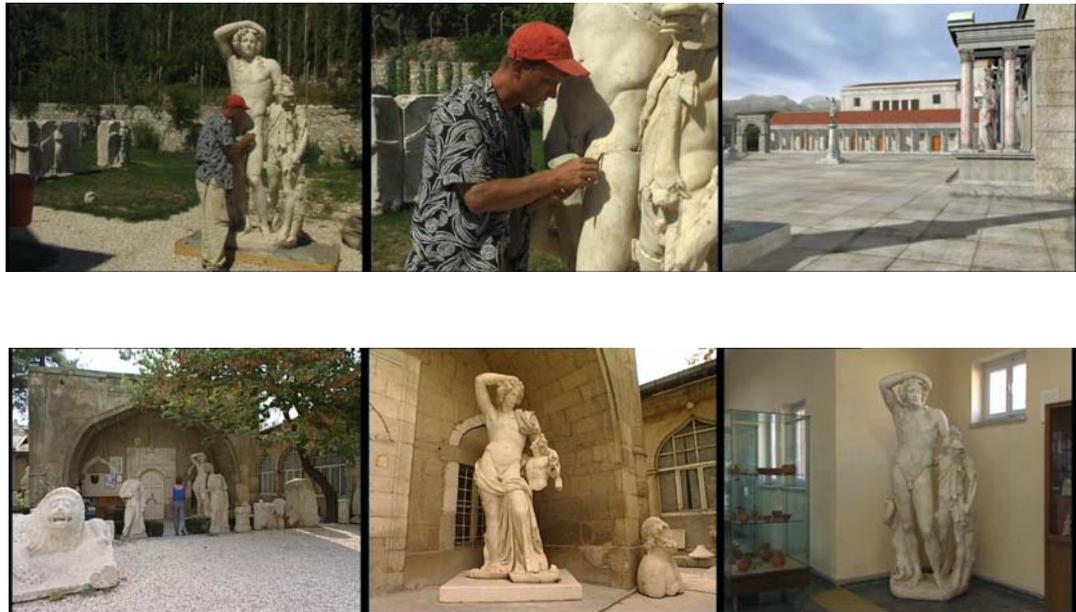
Figure 3.5.1.4. Snapshots showing how a statue is conserved from excavation until exhibition in the museum (Sagalassos Documentary Film, 2003, Axell Company).

The Heroon takes a big share in the film. Not only the original appearance of the building but also its restoration process is presented. Many details are explained about the preparation of the anastylosis project, how the blocks are found, how we understand where they belong, how they correspond to neighbouring blocks, which techniques are used originally and today, why we can not reconstruct the whole building, the importance of authenticity in material, technique, design and setting. The deficiency in this part is the lack of historical stratigraphy. Heroon is a heavily altered building and it is hard to grasp these modifications on site. The information panels are not capable of conveying these, thus VE should be responsible to explain the missing relationships (Figure 3.5.1.5).

Figure 3.5.1.5. The Heroon (Sagalassos Documentary Film, 2003, Axell Company).

The restoration of the Antonine Nymphaeum is also described, completing the picture drawn by the Heroon. The restoration process and the techniques are explained. But the lack of historical stratigraphy is evident here, too (Figure 3.5.1.6).
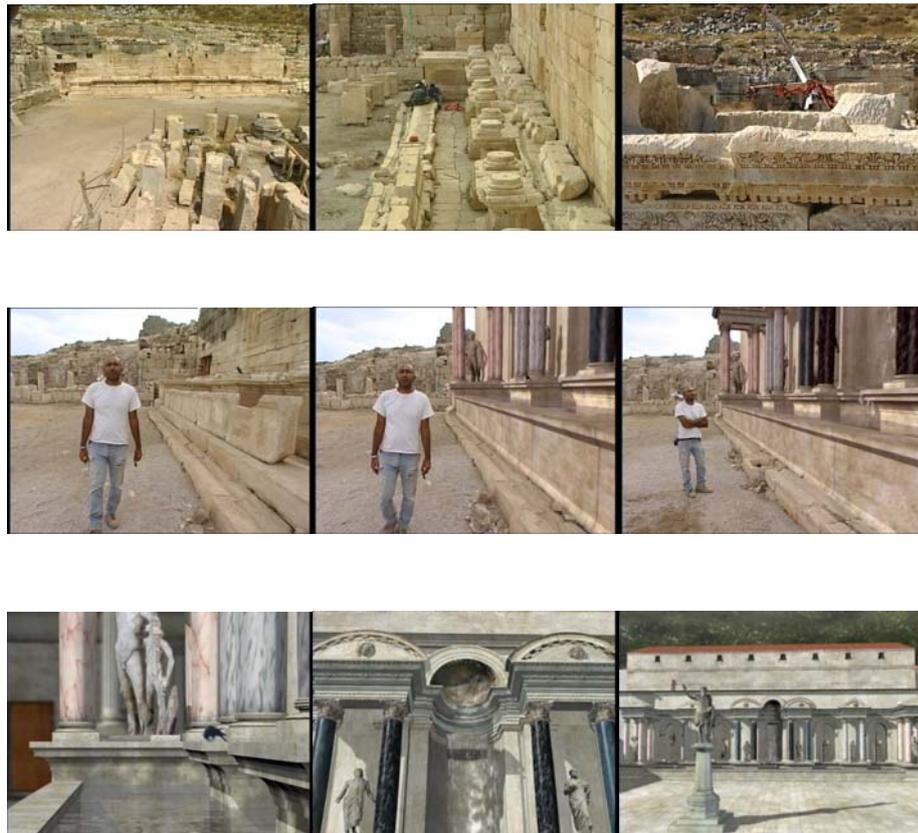

Figure 3.5.1.6. The Antonine Nymphaeum (Sagalassos Documentary Film, 2003, Axell Company).

The film also presents the virtual reconstructions of monuments where only preventive conservation measures are taken but no presentation work is executed. The Lower Agora and the fountains, the Temple of Antoninus Pius, the Boulouterion (Figure 3.5.1.7) and the Theater (Figure

3.5.1.8) are such examples. On site, the theater is left as it is at the time of its collapse during the earthquake. Whereas the Temple of Antonius Pius is observed in single stone blocks rather than a structure. Boulouterion is presented with its historical stratigraphy, like how its courtyard was turned into a cathedral. VE puts the monuments in a proper context and helps to draw a picture in the audience's mind.
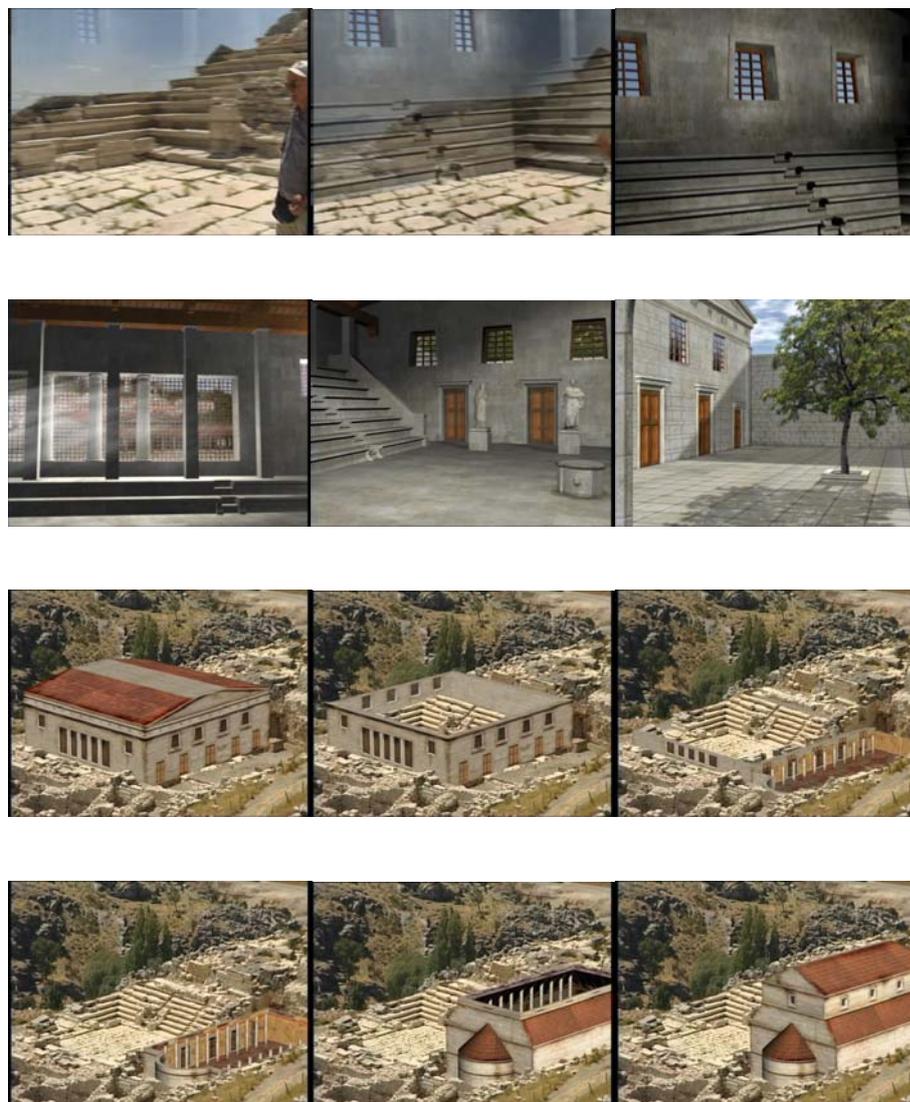
Figure 3.5.1.7. The Boulouterion and its courtyard, (Sagalassos Documentary Film, 2003, Axell Company).
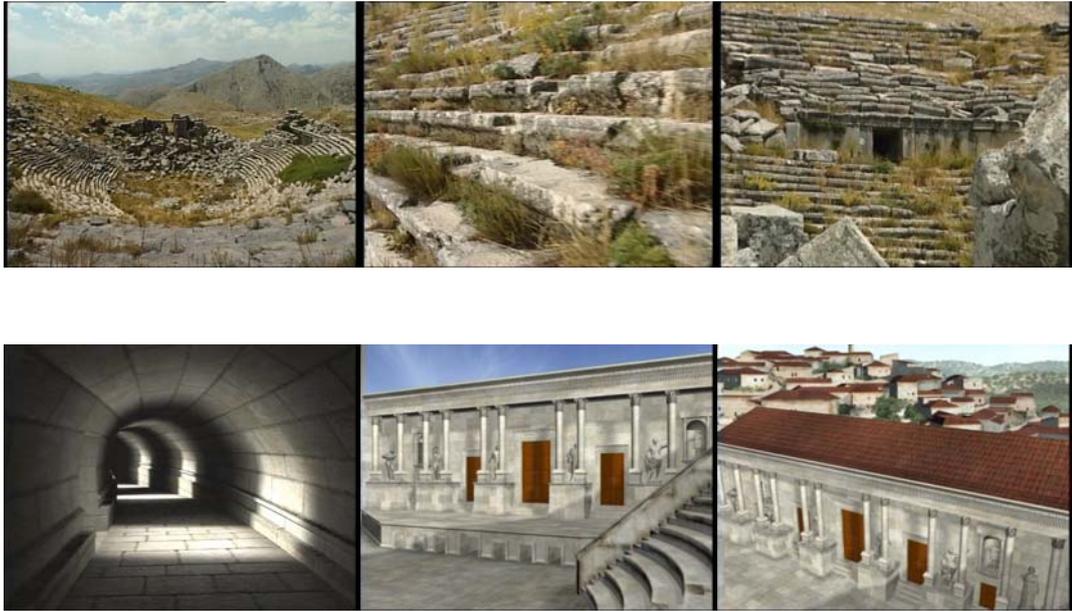
Figure 3.5.1.8. The Theater today and in Roman period (Sagalassos Documentary Film, 2003, Axell Company).

The biggest contribution of the VE presentation is that it may become an alternative to physical reconstructions. Two examples exist for such a case in Sagalassos.

The Roman Baths is the highest remain in Sagalassos. Although one is able to partially reconstruct the building with the preserved material only preventive conservation measures are taken. It is impossible to display the hierarchy of the bathing spaces with physical presentation methods. The scale of the monument rules out a complete presentation study due to temporal and economical limits. Yet, VE offers much more accurate and comprehensible reconstructions.

The virtual presentation of the Roman Baths clerify the relationship of the three parts of the baths (vaulted structural level, hypocaustum level, bathing level) in section as well as their functioning and historical stratigraphy. This aspect is totally lacking in the physical presentation on

site. Yet, in plan level, the hierarchy of the spaces are not evident in the film, either (Figure 3.5.1.9).
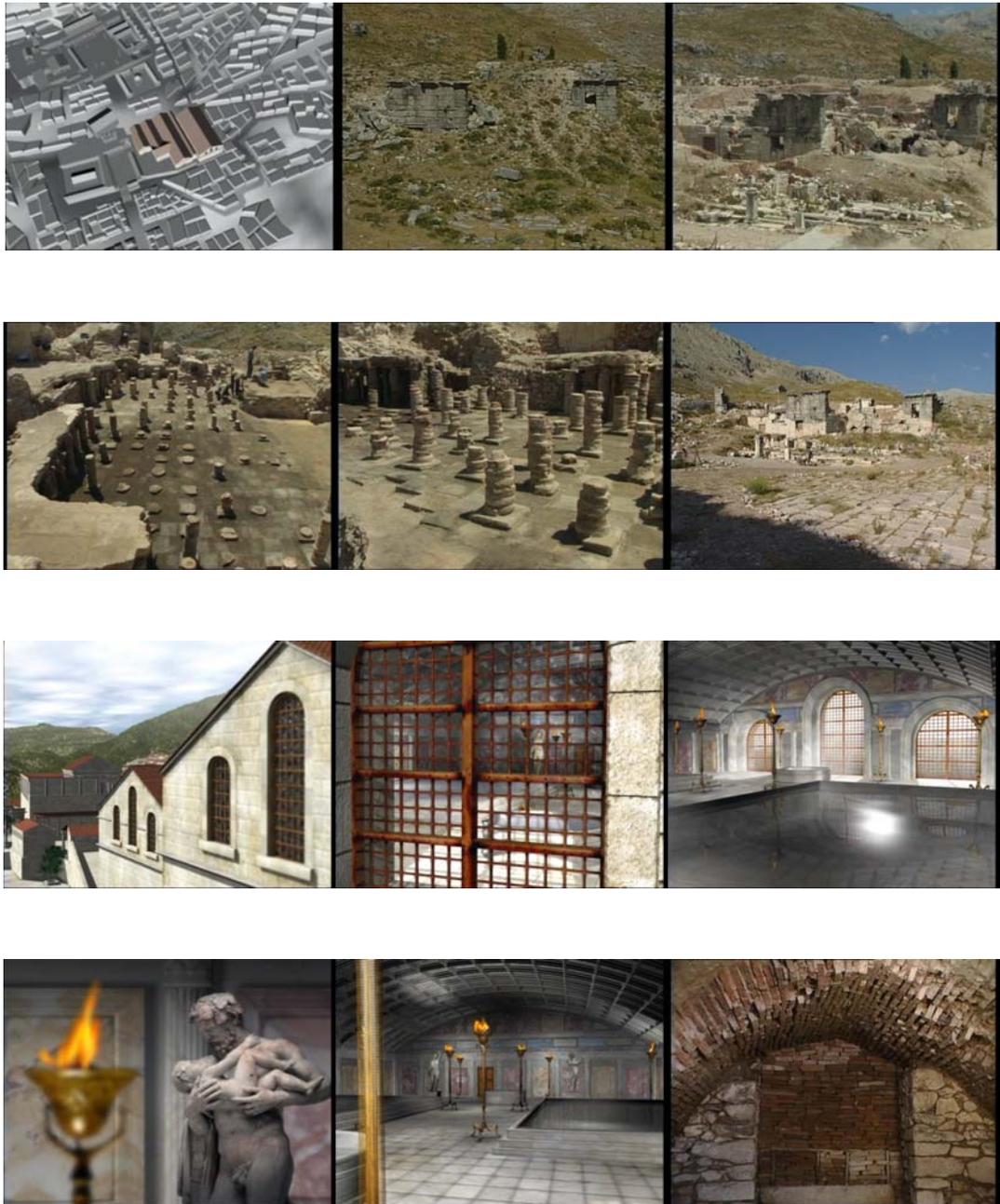

Figure 3.5.1.9. The Roman Baths (Sagalassos Documentary Film, 2003, Axell Company).

The Tiberius Gate is the second example. This monument was first put into plan to be reconstructed. A preliminary trial was also executed for the upper structure of the building, located in a different place from its in-situ spot. Yet, the reconstruction would create another focal point in the Lower Agora and obscure the perception of the nearby monuments. Economic problems would couple the negative impact. So the architectural members of the monument were arranged on site after preventive measures. VE was utilized to bring this monument to life together with its context (Figure 3.5.1.10).

Figure 3.5.1.10. The Tiberius Gate on the Lower Agora (Sagalassos Documentary Film, 2003, Axell Company).

In general, VE complete the presentation of the site which falls deficient through physical interventions. But the virtual presentation may only be viewed before or after the visit to the site of Sagalassos. The

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audience does not have the opportunity to compare and perceive the remains and the presentation at the same time. Thus, the physical reality and virtual environment are perceived separately. Coupled with the time lag, this fact causes many details to be forgotten.

Another serious problem is the updating of the information displayed. The restitution of some of the monuments like the Heroon or the Roman Baths has changed. Other monuments are also recognized in more detail as the archaeological research project continues. Yet this is not reflected to the VE presentation. So the audience is misled at some parts of the story of Sagalassos.

The deficiencies of the recent on site and virtual presentation of Sagalassos should be eliminated. Both should be improved.

3.5.2 Evaluation of the Website of Sagalassos Archaeological Research Project

The website of Sagalassos presents the city in a conventional manner with long texts and photos. Few graphical reconstructions are utilized for monuments such as the Heroon or the Antonine Nymphaeum. The orthographic drawings that are displayed on the on-site information panels are also presented here.
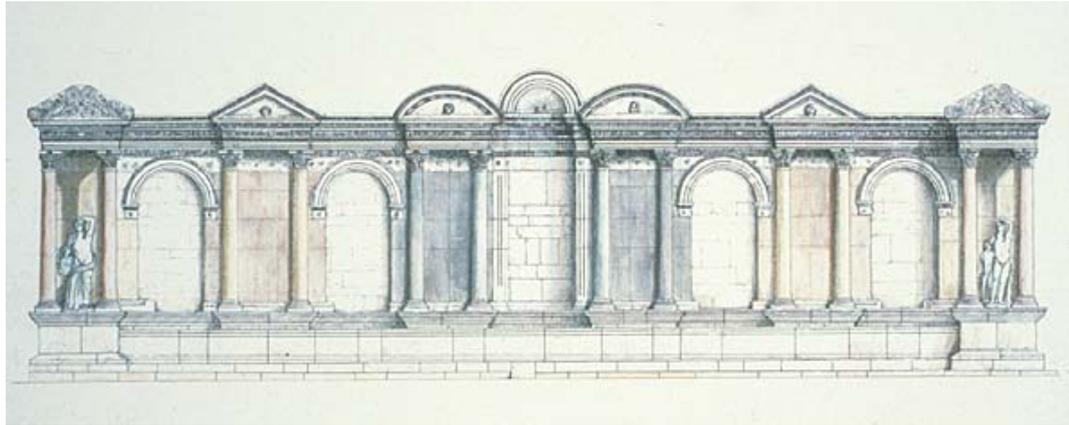
Figure 3.5.2.1. The graphical reconstruction of the Antonine Nymphaeum (Web Site of Sagalassos Archaeological Research Project- SARP, http://www.sagalassos.be, accessed on 10 June 2005).

Sometimes panoramic views of the extant remains are also provided on the web page of the project. However, these are usually displayed immediately after the excavation season has ended.

CHAPTER 4
CONCLUSION

As had been examplified through various cases, any physical intervention in an archaeological site has an impact on the intrinsic values and authenticity of the remains. This impact may be considered positive if it is held at the level of preventive conservation measures. Beyond this line we often face the loss of the mentioned values and authenticity due to the disturbance of the original material, design, construction technique, setting or other related tangible or intangible qualities. Moreover, it is observed that presentation methods such as engravings, photography, reconstructions, didactic restorations, shelters, signs, information panels, graphic reconstructions, models, human guides or costumed interpreters generally fall short of conveying a complete picture of the classical archaeological heritage. However, the main reason behind presenting an archaeological site is to tell its significance to different user groups and guarantee its protection. When the broader public is in question, showing a truly didactic display to raise a conservation conciousness becomes crucial. Thus, VE should be utilized to get rid of the deficiencies of the physical presentation methods.

From conservation point of view, to prepare a comprehensive VE display one has to fulfill several criterias.

* The presentation should have a didactic character:

It should clearly *define its target audience* and *be prepared accordingly*.

It should help to *enhance the experiencing of the archaeological heritage*. "Reality" should be conveyed by a *scientifically valid presentation*. The abstraction should not be taken too far as cloning architectural elements or artefacts. It should reflect the *hierarchy of knowledge* about

the archaeological heritage (between original and hypothetical) not to mislead the audience. This is also important to overcome the inherent problem of VE, that is the provision of an isolated, predefined, overrealistic world.

The presentation should reinforce the *appreciation of the intrinsic values* (documentary, age, education, economic...) of the archaeological heritage. These values show the importance of this heritage and constitute the needs why it should be protected.

* The display should reflect the authenticity of the archaeological heritage:

It should include *different dimensions of authenticity* like form and design, materials and substance, use and function, traditions, techniques, location and setting (architectural and natural context) as well as spirit and feeling (spiritual context), social context and other contexts. Especially the social context, which can not be easily conveyed by physical presentation interventions, is important to show the functions of the seperate monuments and their intangible contexts to the public.

The VE presentation should be multi-temporal and *reflect historical evolution or stratigraphy*.

The display should be flexible in terms of providing alternative stories/ proposals to different user groups like the Ename Project, ArcheoGuide or the Jerusalem Archaeological Park. The presentation should be tolerant to updating as a result of different scholarly perspectives or modified knowledge.

Alternatives should also be valid for the choice of presentation language. If the archaeological site has/ aims to have a certain amount of international visitors, the presentation should be multilingual.

To increase the level of learning, the presentation should be interactive and user-friendly. Such a display gives the visitor an opportunity to create his/ her own path virtually or physically, thus explore more.

* The VE presentation should try to create a conservation conciousness.

Depending upon the feedbacks taken from the touristic visitors of the Ename Center, ArcheoGuide and Jerusalem Archaeological Park, we may claim that when VE is combined with on site presentation, the audience gets the most of information. Moreover, minimum intervention is realized on the remains themselves. Thus, **the presentation should try to be (or is capable of being) an alternative to physical reconstructions and protect the authenticity of the archaeological heritage. VE should be complementary to physical on site presentation interventions.** Other dissemination mediums (through internet, on CD Roms, DVDs...) should be utilized to enhance the site visit beforehand or afterwards.

Problems occur when the aim of producing VE presentations is not defined from the beginning of the research projects. They should be seen as an integral part of the conservation decision making process starting from documentation, not "attached" to it afterwards.

To prepare a scientifically valid presentation, the lack of communication between information users (conservation specialists and managers) and information providers (photogrammetrists, heritage recorders, computer scientists etc...) should be eliminated.[1] Thus, providers must understand the needs of the users.

Sometimes the compatibility of old and newly restored data can not be ensured especially when different versions of softwares are used.[2]

The presentations are not treated as information providing mediums but as "nice pictures". The graphic evidence should be supported with other

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[1] Letellier, R. & Gray, C., "Bridging the Gap Between Information Users and Information Providers- RecorDIM Final Report of Round Table Meeting, Los Angeles, California, March 4-5 2002", Getty Conservation Institute, California, June 2002, p. 7.

[2] Wise, A., 1997, "Digital Preservation in Archaeology", Archaeology in the Age of Internet: Proceedings of the 25th Anniversary Conference of the CAA, Birmingham, April 1997, Proceedings CD/990217_1532/wise1/WISE1.htm.

mediums of data, especially verbal information. Because, this potential and advantage of VE is not present in physical interventions.

The biggest inherent problem of VE is that it presents the information in an isolated, abstract reality confined within itself. No matter how close it comes to physical reality, it always represents an interpretation in a defined order, at certain levels of knowledge, decided by an outsider to be experienced by the audience. Most VE presentations are sophisticated surrogates of archaeological heritage, visually devoured without ever being questioned by this non-professional audience. However, the reality is an experience of numerous inputs and contains more alternatives than usually mentioned. This is why a virtual presentation can not replace a real site visit. Few VE presentations make their audience aware of this fact.[3]

The target audience of the Sagalassos documentary is defined from the very start and it had been prepared accordingly. Here, different proposals are arranged for the academic discussions among scholars and the popular displays for the broader public. This fact affects the presentation positively.

Sagalassos documentary differentiates the existing from reconstructions by utilizing augmented reality. However, the abstraction process should also be transparent as in the case of Jerusalem Archaeological Park.[4]

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[3] Gillings, M., 1997, "Engaging Place: a Framework for the Integration and Realisation of Virtual-Reality Approaches in Archaeology", *Archaeology in the Age of Internet: Proceedings of the 25th Anniversary Conference of the CAA, Birmingham, April 1997*, Proceedings CD/990217_1532/gillin/GILLIN.htm; Barcelo, J. A., "Virtual Museums. When Heritage Does Not Exist", http://www.ace.hu/tudvil/barceloe.html, accessed on 07 January 2005; Ogleby, C., 1999, "How Real is Your Reality? Verisimilitude Issues and Metadata Standards for the Visualization of Cultural Heritage", *CIPA International Symposium 1999, October 3-6 1999, Olinda-Brazil*, http://cipa.icomos.org/fileadmin/papers/olinda/99c207.pdf, accessed on 16 January 2005.

[4] Israel Antiquities Authority & EagleShade Interactive Production House, "Jerusalem Archaeological Park Project", http://www.archpark.org.il, accessed on 20 February 2005.

Sagalassos presentation positively reinforces the appreciation of the intrinsic values of the archaeological heritage. It focuses on different values peculiar to different monuments.

The presentation tries to pay attention to many features of authenticity. One can even observe the patina in the VE presentations. However, some of the other dimensions of authenticity like spirit and feeling (spiritual context), social context and other contexts are lacking. Especially the social context is absent due to the unemployment of virtual human figures. This is a critical minus for Sagalassos. Once, this context is formed, the functions of the seperate monuments will be perceived and their intangible contexts will also be understood.

The Sagalassos VE presentation is multi-temporal on an urban level. This is partially achieved for some monuments like the Late Hellenistic Fountain, the Neon Library or the Boulouerion, too. But, the rest is presented as frozen at a certain moment in time, particularly in the 2nd century AD. Historical stratigraphy should be presented for all of the structures.

The Sagalassos documentary is not flexible in terms of providing alternative stories/ proposals to different user groups as interested visitors, adventurers, children etc. However, the display may be more succesful if it offers alternatives.

Today, in Sagalassos, the updating of virtually presented information is not compatible with the change of archaeological knowledge gathered on site. But updating is the basis for creating a scientifically valid presentation. Moreover, it is the means to inform the public about the latest developments in the research.

The audience is free to choose between English, French or Flemish dubbing of the documentary. However more alternatives should also be valid for the presentation language. As Turkey is the hosting country,

Turkish should also be included at least as subtitles. This is important to inform the local or national tourists.

As can be understood from the name, this presentation is a documentary rather than an interactive and multifunctional display. This fact underestimates a great potential to inform the public about the city. The more interactivity is introduced the more people remember a story. Thus, Sagalassos VE presentation should definitely be interactive.

The Sagalassos DVD certainly aims to create a conservation consciousness. Here, not only the need to protect is mentioned but also the principles of conservation are discussed.

Recently, one is not able to experience the site itself physically and the VE presentation at the same time. As had been mentioned before, this fact creates a time lag which causes many details to be forgotten by the visitor. Although the project had tried to eliminate this disadvantage by providing brochures to refresh the memories of the visitors, it had been clarified that a more comprehensive method had been needed. Thus, the project had decided to combine the virtual presentation of Sagalassos with the on-site presentation to improve both seperate studies. Consequently, SARP had joined the EPOCH Project to realize this.[5]

In our opinion, the potential of VE is not utilized fully in the Sagalassos documentary. The choice of the monuments that are virtually reconstructed is directly overlapping with the ones that are already reconstructed or restored by anastylosis in physical reality. So both virtual and real reconstructions represent the same current knowledge on the same subject. However, VE should be used to represent what can not be done in physical reality. In other words it should be used to enhance the overall presentation. Most important of all, it should be used as a tool not to further intervene to the structures themselves. For example instead of

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[5] For detailed information see the website of the EPOCH Project, (A European Research Network on Excellence in Processing Open Cultural Heritage) at http://www.epoch-net.org.

producing concrete replicas VE can be utilized to give the original appearance of the monuments as in the case of Lower Agora deity reliefs or other statues that had been/ will be transferred to the Burdur Museum. VE should also be used to show the public the urban quarters that are under the ground now. These urban areas may have either been studied through geophysical prospection or have been excavated in the previous seasons but later backfilled for conservation purposes. Or they may be the areas that will be left uncovered for future generations until better scientific methods are developed, but still providing enough information to be presented through the aerial studies. Only than can Sagalassos tell its full story.

In the future, we hope that the problems of VE will be eliminated and more potentials will be realized. Thus, together with on site interventions, a more comprehensive picture of the classical archaeological sites will be presented to the broader audience.

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