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CONWAY LIBRARY ACCESS FOR CHILDREN

An Interactive Qualifying Project

submitted to the Faculty

of the

Worcester Polytechnic Institute

by



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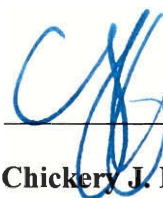


Intaik Park

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Approved:

1. virtual tour
2. web site
3. architecture



Professor Chickery J. Kasouf, Major Advisor

## Abstract

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The Conway Library in London wished to extend its existing web interface to be a teaching tool for secondary school art and architecture teachers. The library proposed that this project link its photograph collection with plans and sections of the Roman Forum and two Roman churches. To achieve this objective, the group gathered requirements information for the project from the Conway staff, created a virtual tour web site, and assessed its quality through survey administration and ethnographic interview performance. This project serves as a blueprint for future Conway Library web site projects. This project is a partial fulfilment of the requirements for each group member's Bachelor of Science degree at WPI.

# Executive Summary

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The Conway Library at the Courtauld Institute of Art in London maintains a collection of almost one million photographs of European architecture, sculpture, and medieval paintings, intended for research by students of art and architecture. The library has applied for funding to digitise one tenth of its photographs to make them more accessible by placing them on the National Grid for Learning. The library staff has initiated a pilot project, digitising and cataloguing in a database five hundred 19<sup>th</sup>-century photographs of Rome. Our project links the images to plans and broadens the potential audience for the digitised images, making the library's parent project a more viable candidate for funding.

A previous WPI Interactive Qualifying Project created a web site that allows technically trained architects and archaeologists to search through the Conway Library's digitised images of the ancient Forum Romanum. The library wished to extend the web interface so teachers of art and architecture can easily access these photographs and so students without a technical background can understand what part of which building or monument they are looking at, as well as the background, history, and structure of that building or monument. The library also wished to extend the digital collection of images to include photographs detailing one of two ancient Roman churches: San Giovanni Laterano or San Clemente. They proposed that we link the photographs with plans of the Forum Romanum and plans, sections, and elevations of the church so that a layperson viewing the web site can click on a location in the plan and view the picture along with a non-technical description.

This project will affect the way art and architecture are presented to young students throughout the United Kingdom. The current method suggested in the National Curriculum for

presenting art and architecture involves displaying posters or overhead transparencies of plans and sections of historical sites and buildings. The web site we designed allows the instructor to supplement these plans with digital photographs of the historical locations in a logical fashion, linking the two media together. This makes the subject easier for students to understand. The technology we implemented provides an easy interface for the Conway Library staff to link plans to digitised photographs of many other sites. Moreover, we supplemented this technology with a manual to allow library staff members, who are experts on the pages' content, to easily develop informative web pages. The product of this project will be published on the National Curriculum and will serve as a blueprint for development of future educational web sites.

We carefully designed a methodology to develop the linking technology and assess its impact on the British education system. Before we started designing the system, we needed to gather information from the Conway Library staff about the existing database of images, the intended web site, and the computing environment. The next step was to design and develop the system according to our sponsor's requirements. After the web site was completed, we assessed it through surveys and participant observation of teachers and students. Lastly, we generated a manual for the Conway Library staff that described procedures of image linking.

At the end of the project, we accomplished all of our objectives. First, we created an educational web site with virtual tours of the Roman Forum and the San Clemente church. This web site is accessible at <http://www.conway.courtauld.ac.uk/tour.asp>. After both virtual tours were completed, we assessed the quality of the web site. Teachers and students from three secondary schools participated in this research. The research results show that the web site we developed is intuitive and has a good potential to be a useful educational tool to be used in classrooms.

We also provided the Conway staff with a virtual tour development tool, allowing the staff to add information in existing tours and to create new tours based on other architectural sites. We accompanied this development tool with a thorough and easy to understand user manual which will guide the staff members through future development of other virtual tours.

According to the WPI 2000-2001 Undergraduate Catalog, “The Interactive Qualifying Project (IQP) challenges students to identify, investigate, and report on a self-selected topic examining how science or technology interacts with societal structures and values. The objective of the IQP is to enable WPI graduates to understand, as citizens and as professionals, how their careers will affect the larger society of which they are part.” The web technology we developed facilitated the learning process for art and architecture in Great Britain’s schools, thus emphasising the interaction of society with technology.

In conclusion, we created a web site which links plans, sections, and elevations to digitised photographs. This web site will become an art and architecture teaching tool for Britain's National Curriculum and will provide a model for future virtual tours. Teachers and students assessed the web site to ensure that it is convenient and useful for them to teach and learn ancient architecture history.

## Acknowledgements

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The completion of this project would not have been possible without the cooperation of many individuals with the project members. First and foremost, the members would like to thank our advisors and instructors at Worcester Polytechnic Institute, Professor Chickery Kasouf, Professor Wes Jamison, and Professor Paul Davis. Secondly, the members would like to thank the Conway Library staff, particularly Dr Lindy Grant and Mr Neil Griendly, for their valuable information, support, and confidence. Lastly, the members would like to thank all individuals who participated in our surveys and interviews: Mrs Nancy Perry, Professor Eleanor Loiacono, Dr Richard Plant, Max Kelen, and the students and teachers from the London Nautical School, St Catherine's, and Graveney.

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## Chapter 1: Introduction

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The Conway Library at the Courtauld Institute of Art in London maintains a collection of almost one million photographs of European architecture, sculpture, and medieval paintings, intended for research by students of art and architecture (Kauffmann, 1987). The library has applied for funding to digitise one tenth of its photographs to make them more accessible by placing them on the National Grid for Learning. The library staff has initiated a pilot project, digitising and cataloguing in a database five hundred 19<sup>th</sup>-century photographs of Rome. Our project links the images to plans and broadens the potential audience for the digitised images, making the library's parent project a more viable candidate for funding.

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# Chapter 2: Literature Review

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## 2.1: INTRODUCTION

Before work on the web site began, we needed to understand the history and architecture of the Roman Forum and the two churches, 19th century photography, and how to effectively assess web site quality. The first part of this literature review contains background information on the historical sites that we will include in the virtual tour. The Roman Forum and the two churches are rich in history, have evolved throughout centuries, and are architecturally important. The second part of the literature review discusses web site assessment from the end user's perspective. Characteristics of the web site that needed to be evaluated by its visitors include quality of information, presentation, aesthetics, and user interaction.

## 2.2: THE ROMAN FORUM

Every great city has its centre. New York has its Time Square, London has its Piccadilly Circus, and Ancient Athens had its Acropolis. Ancient Rome had its Forum Romanum. In order to understand the significance of this historic ruin and its architecture, the history of the Forum must be studied.

### History of the Roman Forum

The Forum, like all places throughout history, had evolved in the course of time. Along with Rome, the Forum went through a transformation from a Republican Forum to the Imperial Forum.

#### The Republican Era.

When ancient Rome progressed from a chaotic monarchy into a united republic, Rome itself was no longer a small city-state in central Italy: in a way, it was Italy. By the early 2<sup>nd</sup>

century BC, Rome had demonstrated its dominance over all of Italy and maintained its superiority over other nations (Zimmerman, 1998).

During the Republican era, Rome was a state controlled dominantly by the plebs (the common people) and less by the aristocracy. The Roman Forum, with its breadth and space, was intended to accommodate mass meetings of the citizen-body, the *populus Romanus* (Purcell, 1993). In the Forum, common people could witness the process of Roman lawmaking and thus the Forum made the people more involved in government (Zimmerman, 1998).

For the aristocracy, the Forum served less of a role as a political platform, but more so in their domestic and economic life. The heartland of aristocratic housing throughout the Republic was the *Via Sacra* (the Sacred Way), which was located inside the Forum (Purcell, 1993). Besides housing the aristocrats, the Forum also accommodated *tabernae* (shops). The *Via Sacra* became a street of market outlets providing luxurious items for the elite (Purcell, 1993).

During the Republican period, the Forum was also a setting for formal spectacles (public performances). The Forum was the principal, if not the exclusive, setting of gladiatorial battles. The combats were usually attested in a funeral procession of a great man such as Marcus Aurelius Lepidus whose funeral in 216 B.C. included gladiatorial combats held in the Forum Romanum. (Purcell, 1993)

The growing ambitions and military successes of Rome proceeded in tandem with the monumentalism of the Roman Forum. Advertisements of triumphal success were often displayed inside the Forum. Galleries in front of buildings were used to exhibit spoil from military victories. Triumphal procession of the Roman military through the Sacred Way had become a tradition with a special significance. During this triumphal age, the first of Roman monumental arches, the *fornix Fabianus*, were built inside the Forum Romanum (Purcell, 1993).



## The Imperial Era.

The Forum developed, expanded, and changed from a symbol of Republican freedom and democracy into a symbol of the Empire. By the end of the era of the Republic, Rome's power in the Mediterranean was undisputed (Zimmerman, 1998). Military victories were celebrated in the Forum, and this striving to display the power of Rome led to new building projects and styles at the Forum.

From 100 B.C. until 100 A.D., the Forum underwent radical changes (Purcell, 1993). This was closely connected with the downfall of the Republic. The Forum's commercial importance declined, but its political and administrative function remained. But where politics and government formerly were public affairs involving the *populus Romanus*, they later became largely the affair of one man, the emperor. The senate lost its substantial power, which went over to the hands of the emperor (Purcell, 1993).

During this Imperial era, the Forum also served its purpose as a mean of propaganda, a practice started by the first emperor of Rome, Julius Caesar. He granted himself a divine status by building his own temple. He had a statue of himself made and finally even built a complete forum dedicated to himself (the Forum of Caesar) next to the Roman Forum. Emperor Augustus and Emperor Titus followed Caesar's suit, building their own triumphal arches and temples (Purcell, 1993).

When Constantine ruled over Rome, Christianity came, which eventually led to a split in the Roman Empire between Rome and Constantinople (Zimmerman, 1998). This confusion demoralised the Roman people who had already experienced significant decline in the empire. During this era, the Forum remained fairly untouched. The Forum underwent some minor restorations and repairs, but no new buildings were added, and old buildings remained

unchanged (Zimmerman, 1998). Control over the empire slowly but surely slipped away from the hands of the emperors and into the hands of the waiting barbarian tribes along the empire's borders: the Vandals, the Visigoths, the Alaric, and the Huns (Zimmerman, 1998). In 401 AD, the Visigoths entered Rome and sacked the city. This and other barbarian invasions in the 5<sup>th</sup> century resulted in widespread looting and the destruction of the Roman Forum (Maszak, 1996).

### **The Excavation of the Roman Forum.**

During the modern Roman era, the Forum had also gone through an evolution, from a cow pasture to a renowned excavation site. Before the 19<sup>th</sup> century excavation of the Forum began, the Roman Forum, also known as the Campo Vaccino, had literally become a *campo vaccino*, a cow pasture. The ruins, surrounded by 18<sup>th</sup> century buildings, were buried under no less than 24 feet of earth and debris. From the 17<sup>th</sup> century well into the 19<sup>th</sup>, farmers used the area as a stockyard and pasture for their herds (Maszak, 1996).

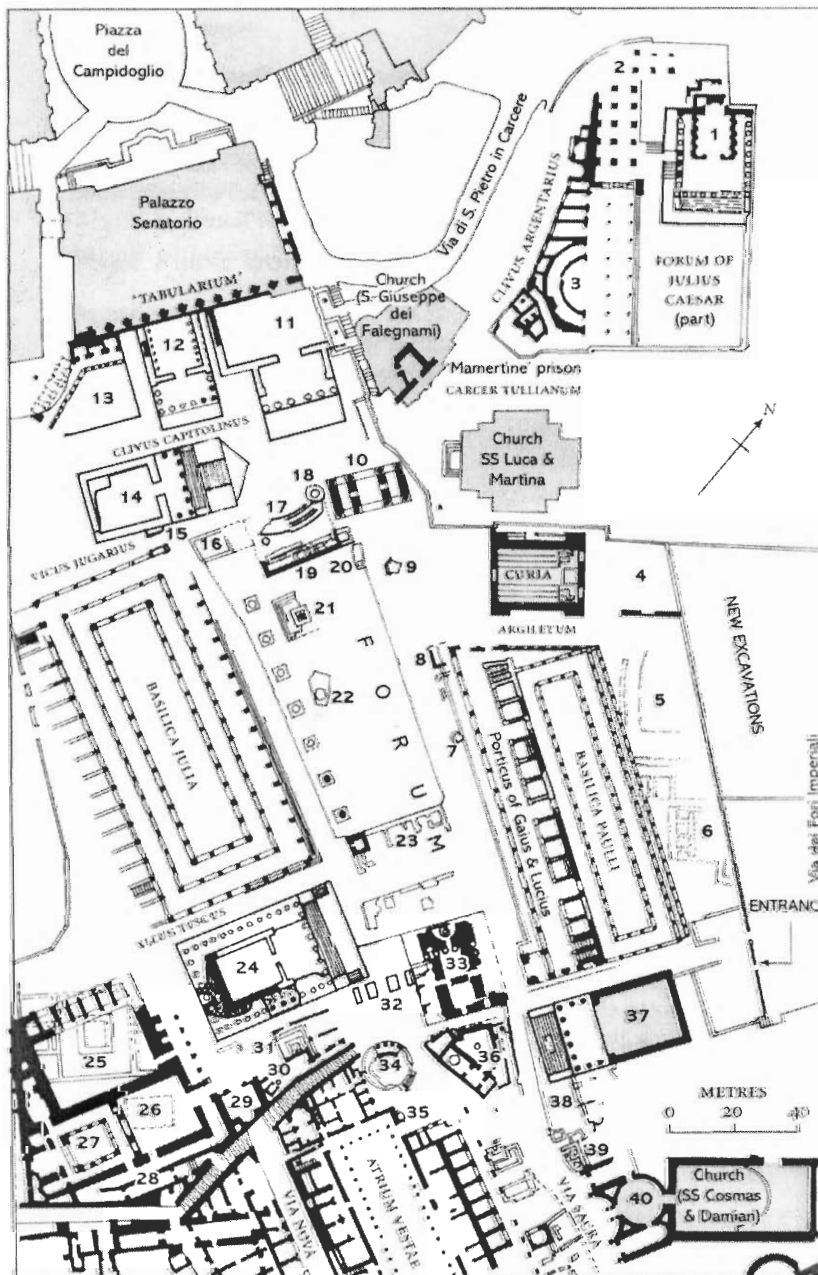
A major excavation of the Forum Romanum started in the 1800s when the newly elected Pope Pius VII appointed Carlos Fea as the director of the excavation, and the work continued through the 19<sup>th</sup> century. By about 1850, the excavation of the Forum had almost been completed (Moatti, 1993). The Forum yielded up one of its last secrets when, in October 1988, an archaeologist found traces of an archaic wall on the edge of the Forum thought to have been built in the 8<sup>th</sup> century BC as a way of defining the sacred space of the city (Moatti, 1993).

### **The Roman Forum Site**

The Roman Forum is a complex site where more than thirty historical buildings and monuments are located (Claridge, 1998). A plan of the Roman Forum as shown in Amanda Claridge's Oxford Archaeological Guide is in Figure 1, below, followed by a list of the buildings inside the Forum. The building numbers in the list correspond to the numbers in the plan. The

periods corresponding to the buildings are based on Mike Zimmerman's The Roman Forum: Through the Ages. Since the Forum buildings were often destroyed and rebuilt throughout ancient Roman history, the periods noted next to the building names correspond to the era when the buildings were last changed, renovated, or rebuilt. These are the way the ruins of the buildings are visible today.

Figure 2.1: Plan of the Roman Forum (Claridge, 1998, p. 60)



1. Temple of Venus Genetrix (Late Republic).

In 54 BC, Julius Caesar began the construction of a second forum, since the old forum had become too crowded. The centrepiece of the new forum was the temple of *Venus Genetrix*, or Mother Venus. This temple helped promote the notion that the Julian family was descended from the goddess Venus through Aeneas and his son Iulus (Burnett, 2000).

2. Basilica Argentaria (Late Republic).

Located inside the Forum of Julius Caesar, Basilica Argentaria was a market place specialising in bronze goods (Platner, 1929).

3. Large public latrine.

4. South corner of Forum of Caesar.

5. South end of Forum of Nerva.

6. Part of Temple of Peace.

7. Shrine of Venus Cloacina (Imperial Period).

This shrine, which consists of a marble ring foundation, is dedicated to the goddess Cloacina. In the process of time, Cloacina was arbitrarily identified with Venus and called Venus Cloacina.

8. Arch of Janus (Imperial Period).

The Arch was built around 356 AD by Constantine II in honour of Emperor Constantine. The formal name of this monument was "Arcus Divi Constantini", or Arch of the Divine Constantine. The Frangipane family transformed the arch into a fortress in the Middle Ages, building a tower on top of it. When this tower was detached in the 19th century, some ancient structures were also removed (Seindel, 1999).

9. Black Stone.

The Black Stone (*lapis niger*), considered an area of ill omen, consists of an irregular patch of bluish-grey limestone paving. Excavation underneath the paving revealed three monuments: a U-shaped altar, a column base, and a tufa block. These monuments were truncated and buried during a restoration in the 1<sup>st</sup> century BC. The Black Stone was built to mark the spots of these monuments (Claridge, 1998).

10. Arch of Septimius Severus (Imperial Period).

This arch was awarded to emperor Septimus Severus and his sons Caracalla and Geta in 203 AD, for their triumph in eliminating enemies in the East. Septimus' family led the Roman army in an attack on Parthia (modern Iran). In 197 AD, they captured Parthia's capital, Ctesphion and annexed a new province of Mesopotamia in 199 AD. (Claridge, 1998)

11. Temple of Concordia Augusta (Imperial Period).

Dedicated by Tiberius in 10 AD, this temple replaced an earlier temple of Concord, which had been struck by lightning or otherwise burned down in 9 BC. At the entrance of this building, stood the stature of Hercules and Mercury, symbolising respectively the security and prosperity during Tiberius' regime. (Claridge 1998)

12. Temple of Vespasian and Titus (Imperial Period).

The emperor Vespasian, builder of the Colosseum, died in July 79 AD with the immortal words, "Pity, I think I'm turning into a God." His son Titus succeeded him and immediately made arrangements for his father's deification, but the new emperor died soon after, in 81 AD. His younger brother, Domitian, completed the temple of Vespasian and dedicated it to Titus as well. (Claridge, 1998)

13. Precinct of the Harmonious Gods (Imperial Period).

This building was refurbished in the second half of the 4<sup>th</sup> century AD (Claridge, 1998).

14. Temple of Saturn (Imperial Period).

The cult of Saturn was very old, and the first temple of Saturn was built in the Republican period (probably in 497 BC). In 360-380 AD, the temple was renovated. An inscription on the building reads, “Destroyed by fire, restored by the Senate and the People of Rome.” (Claridge, 1998)

15. Arch of Tiberius (Imperial Period).

Historians have debated the reason for the construction of this arch. Several possible reasons are to celebrate the recovery of a legion lost in Germany and to commemorate the victory of a Roman general over a Gallic rebellion in AD 26. In any case, emperor Tiberius later added his own inscription onto the monument and hence today, the monument is widely known as the Arch of Tiberius. (Illustrated History of the Roman Empire, 2001)

16. Lacus Servilius (Republican Period).

During the reign of dictator Sulla, the Lacus Servilius became a place of public execution (Purcell, 1993).

17. Caesarian Rostra.

18. Umbilicus Urbis (Imperial Period).

In 20 BC, Augustus set up a small column, the *Umbilicus Urbis*, or “the navel of the city” (Claridge, 1998). The cylindrical brick structure marked the geographical centre of the Forum (Flavia, 2000).

19. Augustan Rostra.

20. Docennalia base (Imperial Period).

In 303 AD, the emperor Diocletian visited Rome, and five honorary columns were erected. One of the column pedestals (lower part of columns) is the Docennalia base. The base contains a relief which displays two winged Victories holding up a shield on which one has written, “CAESARUM DECENNALIA FELICITER” (Happy Tenth Anniversary of the Caesar). (Claridge, 1998)

21. Column of Phocas (Imperial Period).

This column, built in 608 AD, was dedicated to emperor Phocas. Phocas was actually a brutal centurion in the Byzantine army who came to power in 602 AD by assassinating the emperor Maurice and his five sons. In 610, Phocas was overthrown and tortured to death. (Claridge, 1998)

22. Lacus of Curtius (Republican Period).

Curtius' pool is a mystery. Even as early as the 2<sup>nd</sup> century BC, the pool had already dried up, and the Roman people were confused about its significance. Curtius was either a Sabine knight, Mattius Curtius, who fell into a marsh when fighting against Romulus; or a Roman knight, Marcus Curtius who sacrificed himself and his horse to save Rome; or he could be Gaius Curtius, a consul in 445 BC who consecrated the site after it was hit by lightning. (Claridge, 1998)

23. Late Imperial Rostra.

24. Temple of Castor (Republican Period).

A victorious general Aulus Postumius built the first temple of Castor after the Roman victory over the Latins in 484 BC. Castor, a Roman demigod, was the son of Jupiter and a mythical hero. In 6 AD, Tiberius rebuilt the temple and dedicated it in his own name.

(Claridge, 1998)

25. Domitianic Hall (Imperial Period).

In early 90 AD, emperor Domitian built huge buttressed concrete walls behind the Temple of Castor. These walls were parts of Domitian's larger scheme to extend and restructure the Forum. The work did not go very far since the emperor was assassinated in 96 AD. (Claridge, 1998)

26. Forecourt.

27. Atrium.

28. Covered ramp to Palatine.

29. Oratory of the 40 Martyrs.

The Oratory of the Forty Martyrs is a hall decorated with 8<sup>th</sup> century wall paintings that depict forty martyred Christian soldiers who were frozen to death in an icy lake. The hall was presumably part of the larger complex of Santa Maria Antigua church. (Claridge, 1998)

30. Shrine of Juturna (Imperial Period).

This shrine is a rebuild after the fire of 283 AD, but it reused the architectural elements as well as the foundations of its predecessor (Claridge, 1998).

31. Lacus Juturnae (Republican Period).

Lacus Juturnae, named after a river nymph, was one the oldest fountains in Rome. Mythical heroes Castor and Pollux were seen watering their horses in this fountain, which was actually a spring. (Compton's Encyclopedia Online, 1998)

32. Arch of Augustus (Imperial Period).

Although this arch was definitely built by Augustus, the reason for its erection remains



uncertain. It is most likely that the arch was erected in 29 BC to celebrate Augustus' victories in Dalmatia, Egypt, and Actium, but there is also a possibility that the arch was built in 19 BC to commemorate the return of the legion and Romans who had been taken prisoner by the Parthians during their war with Rome. (Claridge, 1998)

33. Temple of Divus Julius (Imperial Period).

In 42 BC, Mark Anthony, Octavian (who later became Augustus), and Lepidus decreed that a temple should be built for the deified Julius Caesar. It was not the first time that a mortal hero had been turned into a god. Caesar himself had paved the way by actively promoting the concept of his own divinity when his face was put on a coin while he was still alive. Caesar set a precedent for many of his predecessors who deified themselves. (Claridge, 1998)

34. Temple of Vesta.

Standing at the centre of the Roman Forum, the temple of Vesta was probably built by Numa Pompilius, the second king of Rome and the founder of the cult of Vesta. Inside the temple was the "holy fire," symbol of the life of Rome. The fire, never to be extinguished, was tended by the six Vestal Virgins. (Bonenkamp, Horsthuis, & Mentink, 1997)

35. Shrine.

36. Regia.

Regia, meaning the royal palace, was actually a sacred place. The chief priest (*pontifex maximus*) and his staff held official meetings and stored their records here but they lived elsewhere. (Claridge, 1998)

37. Temple of Divus Antonius and Diva Faustina (Imperial Period).

Antoninus Pius built the temple for his wife Faustina, who was deified after her death in 140 AD. When Antoninus Pius died and was deified twenty years later, the temple was also dedicated to him. (Claridge, 1998)

38. Archaic burials.

39. Basement of the Late Republican house.

40. Temple of Divus Romulus (Imperial Period).

The Temple of Romulus is a round, little shrine, which was built by emperor Maxentius for his young son Romulus who passed away in 309 AD and was later deified. The building of the temple was finished under emperor Constantine. (Bonenkamp, Horsthuis, & Mentink, 1997)

Basilica Julia (Late Republic).

Julius Caesar dedicated this basilica for himself when it was not yet finished in 46 BC. It was completed by Augustus but burned down soon afterwards and took another twenty years to rebuild. Augustus dedicated the building once more in 12 AD, this time in the names of his deceased heirs, Gaius and Lucius Caesar. This latter name did not catch on, and the basilica remained known as basilica Julia. (Claridge, 1998)

Basilica Paulli (Republican Period).

The construction of this basilica was first started in 55 BC by Lucius Aemilius Paullus and finished by his son Lucius Aemilius Lepidus Paullus in 34 BC. After only twenty years, the basilica burned down, together with row of shops. Later, Augustus reconstructed the basilica and the shops in tandem. The rebuilt basilica was dedicated in the name of its original constructor, Aemilius Paullus. (Claridge, 1998)

## **The Roman Forum in the 19<sup>th</sup> Century**

Although the Forum had gone through extensive excavation by the mid 19<sup>th</sup> century, the condition of the Forum still managed to appal visitors who witnessed the cow pasture, the public housing, and other forms of domestication in the Forum. An American photographer, William Dean Howells, was one of the dismayed visitors. He wrote in his diary, “In hollows below the level of the dirty cow field, wandered over by evil-eyed buffaloes, and obscenely defiled by wild beasts of men, there stood here an arch, there a pillar, yonder a cluster of columns crowned by a bit of frieze” (quoted in Maszak, 1993).

In our project, we will deal with 19<sup>th</sup> century photographs of the Forum; therefore, it would be useful to learn about the condition of the Forum in the 19<sup>th</sup> century and the 19<sup>th</sup> century photographers’ view toward the Forum.

### **Difficulty in understanding the ruins.**

According to Andrew Maszak in his article, “Forum Romanum/Campo Vaccino” (1993), the significance of the Forum Romanum depended heavily on the Forum's association with rich Roman history. Unfortunately, by the 19<sup>th</sup> century, the Forum had lost not only its grandeur, but also its comprehensibility. Too many elements from different periods had been jumbled together, and visitors and photographers who were unfamiliar with the Forum’s rich history confronted a difficult task in making sense of the ruins. (Maszak, 1993)

Returning to the Forum 40 years after his first visit, William Dean Howells examined what the archaeologist had accomplished in the previous decades. Paradoxically, Howells found that the real problem in comprehending the Forum was not caused by the domestication of the Forum, but the complexity of the Forum itself. Howells argued that each of the Forum buildings was indeed magnificent and beautiful, but taken as a whole, the Forum was “brutally

unbeautiful.” He elaborated more about the reason behind his reaction: “After all, the imagination is very childlike, and it prefers the elements of its pleasures simple and few; if the materials are very abundant or complex, [imagination] can make little out of them; they embarrass it, and it turns critical in self-defense” (quoted in Maszak, 1993). He speaks for many, or perhaps the majority of 19<sup>th</sup> century visitors. Most travellers found the Forum too complicated and its history too dense. People wanted simplicity and drama. They wanted stories behind the ruins. (Maszak, 1993)

### **Unsatisfactory photographs.**

19<sup>th</sup> century photographers, like the majority of the Forum visitors, were unfamiliar with the Forum's rich history. They confronted a difficult task in making sense of the ruins, and this confusion is reflected in 19<sup>th</sup> century collections of photographs of the Roman Forum, such as the *Vue prise du Campo Vaccino* (Maszak, 1993). Images from this collection fail to provide any visual clues that might recall the Forum's exalted history. None of the remaining arches or columns is included, sculptural decoration is barely visible, and a viewer has to look carefully to discern the remnants of the ancient buildings. Descriptions on these photographs were also minimal since the photographers were not familiar with architectural terms. Robert Macpherson's catalogue of 1865, for example, offers in sequence: “15. Forum Romanum, looking toward the Capitol. / 16. Forum Romanum – A general view...” (Maszak, 1993). Such deficient descriptions were hardly appreciated by the readers and left little room for the imagination.

## 2.3: ANCIENT CHURCHES

### The San Clemente Church

#### History of the San Clemente church.

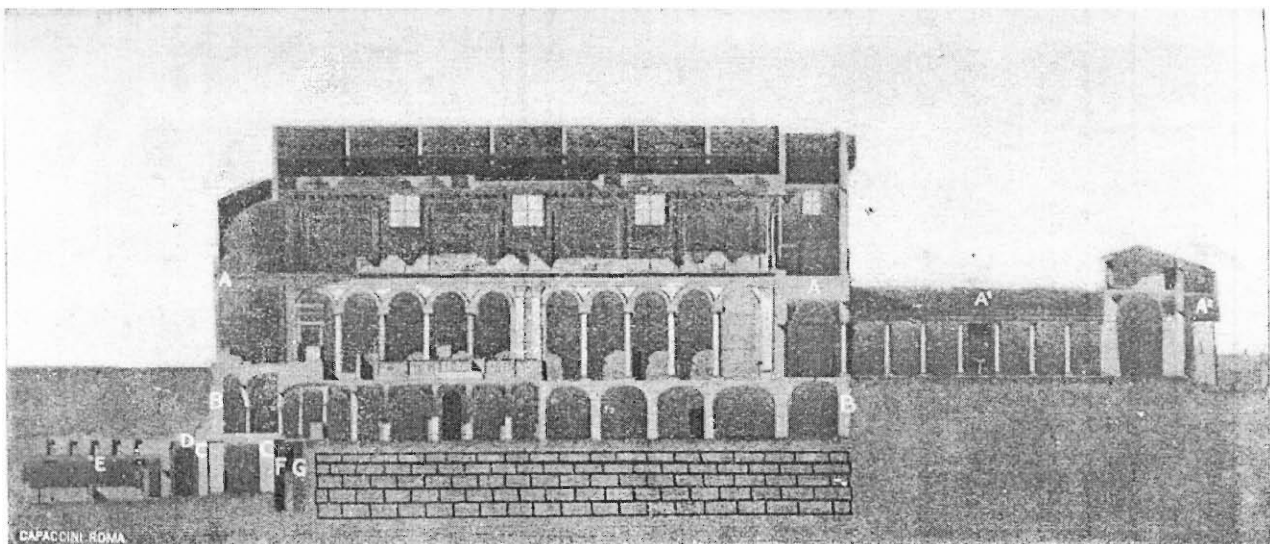
San Clemente is one of the most important churches in Rome with its unique “Archaeological Stratification,” providing three distinct levels of Christian history in Rome (Nolan, 1925). The San Clemente church has a present-day church, which is on the street level. Below that present church, there is a 4<sup>th</sup>-century basilica that is “one of the first Christian basilicas, and the oldest in existence,” (Nolan, 1925). Below that basilica, there are 1<sup>st</sup>-century structures, including a temple and walls of the early Roman period. Indeed, “San Clemente is not one, but three churches constructed one above the other, resting on the remains of earlier Roman habitations,” (Hager, 2000) so the archaeological and architectural importance of this church is immeasurable.

The historical pope St. Clemente, to whom this church is dedicated, was “the third successor of St. Peter and the author of a famous letter to the Corinthians (96 AD)... According to legend, St. Clemente was banished by Trajan (98-117) to the Crimean mines, where he converted so many soldiers and fellow prisoners that the Romans tied an anchor to his neck and threw him into the Black Sea,” (Hager, 2000). It is said that he was rescued by angels and conveyed to an underwater tomb. Afterward, St. Cyril and St. Methodius recovered St. Clemente’s body from the Crimean Sea during Slavic missions and brought the relics of St. Clemente to Rome. (Nolan, 1925)

## Architectural structure of the San Clemente church.

The architectural characteristics of this complex church are clearer if they are studied with the corresponding periods in which they were constructed in mind (Rapaport, 1989). The church of San Clemente can be divided into four different structures, in chronological order: Roman walls of the year 64 AD, 1<sup>st</sup>-century structures, the 4th-century basilica, and the present-day church. A section drawing of the San Clemente church is presented in Figure 2, below.

Figure 2.2: Section of San Clemente (Bumpus, 1898, p 5.)



AA. Present Basilica

A1. Atrium of Present Basilica

A2. Entrance to Atrium

BB. Fourth century Basilica

CC. *Dominicum Clementis* (I. Century)

D. Ambulaerum

E. Temple of Mithras

F. Wall of Imperial Period

G. Wall of Republican or Kingly Period

At the third level below the present church, there are ancient Roman brick walls and brick pavements, which were discovered during the construction (1912-14) of a tunnel to drain a lake located under the basilica. The walls and pavement are believed to have been identified as the

charred remains of houses that were destroyed by the fire that Emperor Nero set in 64 AD.

(Hager, 2000)

There are two buildings on this third level. On one side is a large, rectangular structure of “tufa blocks, travertine, brick, and stone,” and on the other side is a brick insula, or apartment complex (Hager, 2000). The larger structure is the house of St. Clemente, excavated in 1869 (Nolan, 1925). The reason that is assumed to be St. Clemente’s house is that “in the fourth century, it was not the custom to dedicate a church or oratory to a saint unless built over the tomb of the saint, or erected in or over the house of the saint. As S. Clemente’s tomb was in the Crimea, where his body remained until the ninth century, we are led to the conclusion that the grand fourth century basilica dedicated to him was built over the house of the saint.” (Nolan, 1925) It is supposed to have been used as a house of prayer – a secret meeting place for the Christian community when Christianity was prohibited (Hager, 2000). This is also mentioned in Bumpus’s book (1898): “Several of these subterranean churches remain, as at Sta Pudenziana, San Clemente, San Sylvestro, etc.”

On the other side, a small Mithraic temple of the 2<sup>nd</sup> or early 3<sup>rd</sup> century was built into the 1<sup>st</sup>-century insula, or apartment building. The temple consists of stone seating for the initiated, thick pilasters supporting the vestibule arches, and a stucco ceiling with geometric and floral patterns reflecting Mithraism, which was a cult that spread throughout the Roman Empire from middle of 1<sup>st</sup> century to the late 4<sup>th</sup> century. (Hager, 2000)

Over these structures is a 4<sup>th</sup>-century basilica supporting the more recent church above. Nolan (1925) depicted this ancient church as “one of the first Christian Basilicas constructed in Rome, and the oldest in existence.” This church is founded at the period of Emperor Constantine, who embraced Christianity. Hager (2000) cited St. Jerome: “The new church is

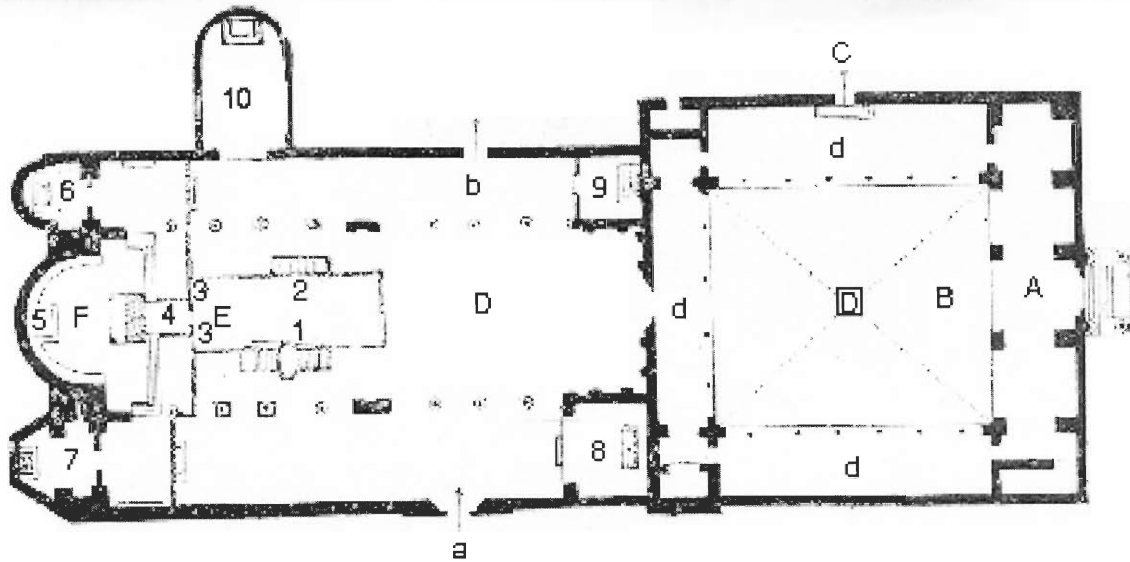
dedicated to Pope St. Clemet, a contemporary of the Roman Consul Clement. As the centuries pass, San Clemente becomes one of Rome's best-loved and most adorned churches." This church building, however, was burned to the ground when the Normans, under the leadership of Rovert Guiscard, came to Pope Gregory VII's relief by forcing the German Emperor Henry IV from the streets of Rome. The church was abandoned and forgotten for eight long centuries until an amateur 19<sup>th</sup>-century archaeologist accidentally discovered it. (Hager, 2000)

In this 4<sup>th</sup>-century basilica, many valuable Byzantine frescos were lying beneath the present church building. "Our Savior, Archangels, and Saints" portrays Jesus, Archangel Michael, Archangel Gabriel, St. Clemente, and S. Cyril. The "Shrine of S. Clement in the Sea," "The Translation of S. Clemente's Relics," and "Slavic Missionary" are some of the important frescos.

Finally, the present church was erected in 1128 over all those subterranean complexes under the guidance of Pope Paschal II (Hager, 2000). "The building was assumed to have been the same described by St. Jerome in the year 392," (Hager, 2000). Other restorations that took place in the 18th century by Clement XI are more likely to be of early Gothic style (Nolan, 1925). This building is a reproduction of primitive arrangements of the original S. Clemente church, including the atrium and propylon (Hager, 2000). See the plan of S. Clemente in Figure 3 on the next page.



Figure 2.3: Plan of Present Church at San Clemente (Bumpus, 1898, p. 12)



- |                           |                             |                              |
|---------------------------|-----------------------------|------------------------------|
| A. Entrance to atrium     | b. Entrance to sacristy and | 8. Chapel of S. Catherine of |
| B. Atrium                 | subterranean basilica       | Alexandria                   |
| C. Entrance to convent    | d. Quadriportiens           | 9. Chapel of S. Dominic      |
| D. Nave                   | 1, 2. Ambones               | 10. Chapel of Ss. Cyril and  |
| E. Choir                  | 3. Marble screen            | Methodius                    |
| F. Presbytery and tribane | 4. High Altar               |                              |
| a. Side entrance from San | 5. Episcopal Throne         |                              |
| Giovanni                  | 6. Chapel of S. John        |                              |
|                           | 7. Chapel of B. Sacrament   |                              |

The atrium and propylon contain valuable treasures. First of all are the brilliant gold and jewel-like colours of the basilica's apsidal mosaic. "The central crucifixion, represented as a graceful tree of life, sprouts from a leafy base fed by bright blue streams," (Hager, 2000). This is one of the most famous mosaics in this church. Secondly, another well-known feature in San Clemente is a white marble choir, which was donated by Pope John II (522-535) to the earlier basilica and then transferred above (Hager, 2000). Finally, another notable feature of the church

is the Martyr's Tomb, below the altar, which contains the relics of St. Clement and St. Ignatius is another notable figure in this church.

## **The San Giovanni Laterano Church**

### **History of the San Giovanni Laterano church.**

At the beginning of Christianity and before the rein of Emperor Constantine, church buildings were located either in small rooms at the top of houses or in chambers below the street level. "The earliest churches were chambers in the houses of the more wealthy Christians because being Christian meant to incur the risk of persecution and suffering and the followers of new religion were not anxious to have very large or conspicuous buildings," (Bumpus, 1898). This situation changed when Emperor Constantine embraced Christianity (Bumpus, 1898)

The first work Emperor Constantine ordered was the building of churches dedicated to Christ. San Giovanni Laterano is one of these churches. Constantine and his wife Fausta happened to possess a very large palace in Rome, which once belonged to a senator named Plautius Lateranus, and hence was called "the Lateran" (Bumpus, 1898). According to Bumpus' description in his book, San Giovanni Laterano was first built on this private palace and a portion of the building was destroyed to accommodate the church. A residence for the Bishop was built on the remainder of the old structure. After the construction was accomplished, Constantine, dedicated the church to "The Holy Saviour, Sancto Salvatori." (Bumpus, 1898) The importance of this church could not be understated, and Bumpus (1898) mentioned in his book that "this church is, properly speaking, the real and true Cathedral Church of Rome."

The church had been through numerous destructions and reconstructions throughout the 4<sup>th</sup> to the 18<sup>th</sup>-century A.D. The first ordeal of San Giovanni Laterano happened at the beginning of medieval period. At this period, the church was consistently ruined by "willful demolition or

hostile assault, of almost all the principal classical remains.” Every citizen was permitted to liberate the antique monuments and break up sculptures or marble fragments for the sake of the materials. Castles and brick towers were built around the church, concealing the ruinous structure. (Bumpus, 1898)

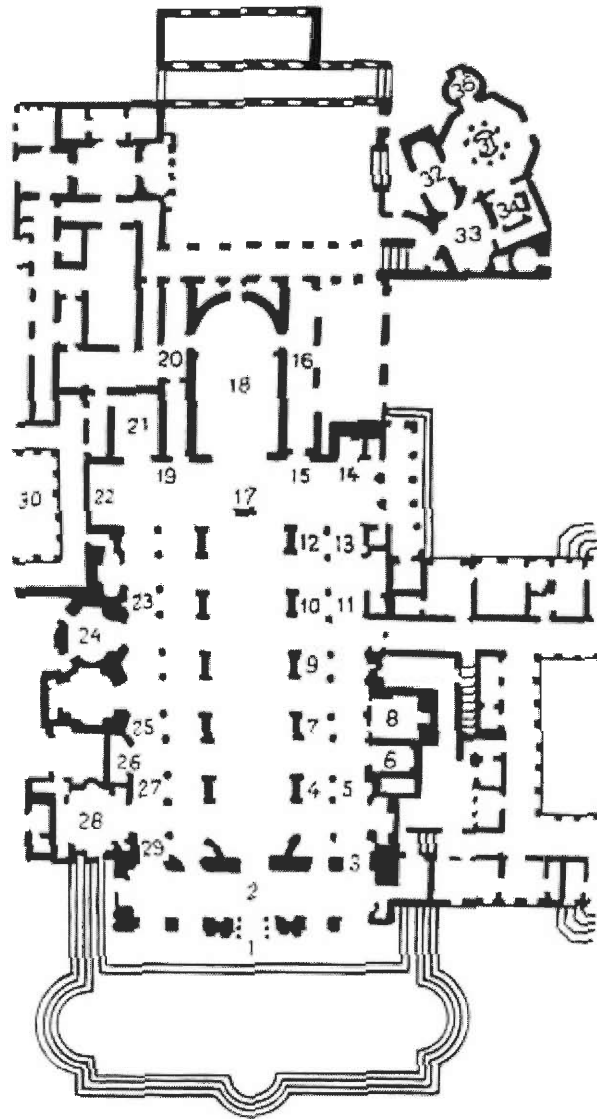
In 897 the Lateran was totally ruined, “sinking under the weight of its feeble age,” (Bumpus, 1898). The church remained in this condition for several years before Pope Sergius III completed the rebuilding between 904 and 928. Soon after, however, the roof caved in, crushing the colonnades below. The basilica was again left in an appalling condition for about four years before another restoration took place. In 1364, Urban V ordered the restoration of the entire Lateran basilica. During the restoration, Urban V added many Gothic features to the church, such as a tabernacle, rich in sculpture and paintings, erected over the high altar. The current church that is left standing today is based upon this restoration. (Bumpus, 1898)

After the restoration of Urban V, there were several restorations held by various popes: Martin V, Sixtus IV, Eudenus IV and Alexander VI. These renovations gave the church a distinct sixteenth century style, and some original Roman architectural features were lost forever. (Bumpus, 1898)

### **Architectural structure of the San Giovanni Laterano church.**

The San Giovanni Laterano church holds numerous valuable Roman mosaics, columns, and portraits. The importance of the this church is mentioned in Bumpus’s work (1898): “if men knew what treasures of indulgence the Lateran church contains it would no longer be deemed necessary to go on pilgrimages to Jerusalem or to St Iago in Galicia.” A plan of the church is in Figure 4, below, followed by a list with numbers referring to those seen in the plan.

Figure 2.4: Plan of San Giovanni Laterano (Nyborg, 2000)



- |   |                                     |                                    |
|---|-------------------------------------|------------------------------------|
| 1. Façade   | 5. Statue of St James (now removed) | 9. Sepulchre of Pope Alexander III |
| 2. Narthex/vestibule  | 6. Torlonia Chapel                  | 10. Sepulchre of Pope Sergius IV   |
| 3. "Holy Door"  | 7. Cenotaph of Pope Sylvester II    | 11. Tomb of Cardinal Giusanno      |
| 4. <i>Boniface VIII announcing the Jubilee of 1300, by Giotto</i> | 8. Massimo Chapel                   |                                    |

- |   |  |   |
|---|--|---|
| 12. Tomb of Cardinal<br>Ranuccio Farnese          | entrance to shop and<br>treasury                   | 29. Statue of Riccardo degli<br>Annibaldi |
| 13. Monument to Cardinal<br>A. Martinez-Chiaves   | 21. Colonna Chapel and<br>Winter Choir of the      | 30. Cosmatesque cloisters                 |
| 14. Chapel of the<br>Crucifixion                  | Canons   | 31. Baptistry                             |
| 15. Tomb of Pope Innocent<br>III                  | 22. Altar of the Blessed<br>Sacrament              | 32. Chapel of Sts Secundus<br>and Rufina  |
| 16. Leonine Portico                               | 23. Monument to Cardinal<br>Girolamo Casanate      | 33. Chapel of St Venantius                |
| 17. High altar/ <i>confessio</i>                  | 24. Lancellotti Chapel                             | 34. Chapel of St John the<br>Evangelist   |
| 18. Sanctuary and apse                            | 25. Sepulchre of Cardinal<br>Bernardino Caracciolo | 35. Chapel of St John the<br>Baptist      |
| 19. Monument to Pope Leo<br>XIII                  | 26. Chapel of the Transition                       |   |
| 20. Corridor with remains<br>of ancient basilica, | 27. Sepulchre of Gerardo da<br>Parma               |   |
|   | 28. Corsini Chapel                                 |   |

The Lateran contains the works of different periods in one building. The church still accommodates the remains of the buildings constructed in the era of Emperor Constantine. This church is merely a great hall inside the Lateran palace, which can be seen beyond the ancient gateway built into the Honorian walls, with structures of the Gothic style of the 16<sup>th</sup> and 17<sup>th</sup> centuries added by Urban V and many other popes. (Bumpus, 1898)

The dimensions of San Giovanni Laterano are enormous. The church consists of five aisles, originally divided by stone or marble columns (Bumpus, 1898). The Lateran has several important features that need attention.

First of all, the Corsini Chapel, located on the left hand side of the nave, is one of the important architectural features of the Lateran. This chapel is said to be a work of Alessandro

Galilei in 1729. This chapel's plan is square, but it has a large recess on each of the four sides, thus forming a Greek cross. "The whole is surmounted by a cupola and adorned with paintings and marble of the most precious description," (Bumpus, 1898).

Other important marks of this church are the mosaics. Two mosaics here are of the head of Jesus. One is on a tympanum, located at the top of the façade of the church; the other is of darker complexion, and is located on the upper part of the apse, overlooking the sanctuary. Nicholas IV built another great mosaic, located on the vault of the apse. Bumpus (1898) described this mosaic as "one of the most admirable for composition and mystic meanings in Rome."

The next important features of the church are four tall bronze columns that flank the Altar of the Blessed Sacrament. "These pillars are said to have been brought by Titus from Jerusalem, also to have been filled with earth from the Holy Land," (Bumpus, 1898). Moreover, the Lateran has a magnificent number of the treasures of Rome, which are not mentioned above. Those include: Giotto's picture, found on the second pier of the first aisle on the right side of the church; the Façade, rebuilt by Alessandro Galilei in 1732 with strong influences of the Baroque and Neo-Classical style; the "holy staircase," retrieved by Constantine's mother, St Helena, from Jerusalem, which is said to be the steps that Jesus walked down after being condemned by Pontius Pilate (Italian Connection, 2000); and the 13<sup>th</sup> century cloister, the masterpiece of Pietro Vassalletto, with twisted columns (Nordhagen, 2000).

The history of the Forum and the churches is significant for our project. When students study art and architecture, they need a way to connect to the objects. A story adds a human component to an art or architecture object. Art and architecture teachers use stories to entice the students to learn more about an object even after the class is over. (Perry 2001) We expect the

stories behind the Forum and the churches, when displayed along with photographs of art and architecture pieces, to have this same impact on the students.

#### **2.4: WEB SITE DEVELOPMENT AND ASSESSMENT**

Now that we had an understanding of the content of the web site, we had to prepare to develop the site itself. Before development began, we had to know how we were going to present the information in a manner that was appropriate. The information found on the site as well as the way in which the information was presented had to be carefully considered. When the web site was completed, the people who were going to access it for use in the classroom had to assess the site in order to ensure that the quality demands of the site were met.

##### **Quality Development and Presentation**

###### **Information quality.**

The most important measure of web site quality is the quality of the information found on the site, both intrinsically and in the context of the way it is used (Strong, Lee, & Wang, 1997). There are four types of information quality that must be considered: its intrinsic quality, its accessibility, its representation, and its contextual quality. (Strong, Lee, & Wang, 1997)

The intrinsic quality of information includes its accuracy and objectivity, how believable the data is, and how reputable the source of the data is (Strong, Lee, & Wang, 1997). The accessibility of information must ensure that the information can be accessed easily and that the contents are secure from being tampered (Strong, Lee, & Wang, 1997; Loiacono, Watson, & Goodhue, 2001). Information systems professionals must recognise the difference between technical accessibility and the accessibility concerns of a system's users (Strong, Lee, & Wang, 1997).

The representational quality of information is a measure of how easily it can be interpreted, how understandable and concise the information is, and how consistent its presentation is (Strong, Lee, & Wang, 1997). The technologies used to represent information in a good web site must be a good fit with the tasks for which it will be used (Goodhue & Thompson, 1995).

The contextual quality of data includes its relevance and value to the person accessing the data, and the data's completeness. Information must be presented in an amount appropriate to the intended meaning of the presenter: neither too much, nor lacking in context or content. (Strong, Lee, & Wang, 1997) To be effective, an information system must be able to be utilised properly by those who intend to use it (Goodhue & Thompson, 1995). For our project, this implies that the system must be usable in a learning environment. Specifically, art and architecture teachers must find the site useful in teaching young students.

### **Information presentation.**

Research and experience from experts has shown that storytelling – specifically, the chronological ordering of information and inclusion of a context for the information – is an effective way to represent information in an educational environment (Rapaport, 1989; Tannehill, 1999). Children and adults alike have been shown to remember information better when presented in an appropriate context, that is, when the meaning is presented and the information's usefulness is justified (Smoliar & Baker, 1998). The American National Council of Teachers of English has recognised the importance of storytelling as an effective teaching method (Committee, 1992). For our project, this implies that in order to be an effective teaching tool, the virtual tour on the web site will be presented in a story format, with events in chronological order and accompanied with descriptive text, making clear the context in which



the buildings and monuments were constructed. This will make the web site interesting to the students, encouraging them to learn from the information presented.

### **Web Site Quality Assessment: WebQual**

WebQual is a web site quality assessment tool that was developed to focus specifically on the perspective of the end users of the site. Although it is a survey tool developed to assess the quality of an electronic commerce site, nine of the twelve points that it measures are relevant to an educational site. It is effective because ultimately the end users of any information system are the judges of how useful the system is. (Loiacono, Watson, & Goodhue, 2001) We will describe the ten measures that WebQual considers which are relevant to our web site development project.

#### **1. Information quality / fit-to-task.**

The quality of information consists of a few different measures. It must be current, correct, and have the right level of detail. It must also successfully assist the site's visitors to complete a task (Loiacono, Watson, & Goodhue, 2001; Goodhue & Thompson, 1995). For our web site, this means that we must use the most recent information about the pictures that is available, and must design the site so that it assists the teachers in teaching art and architecture without the students wondering about things we have not included or feeling there is too much information to comprehend and absorb.

#### **2. Interaction.**

A good web site must include a way for the visitors to participate. They must be able to modify the pages' contents, communicate in user groups, download software, and/or email feedback to the site's maintainers. (Loiacono, Watson, & Goodhue, 2001)

### **3. Trust.**

Users should feel that the content of a site is accurate and secure (Loiacono, Watson, & Goodhue, 2001). If the validity of the content is questionable, teachers will refrain from using it as a teaching tool.

### **4. Response time.**

The contents of a good web page should load into the visitors' computers in as little time as possible, and the site must respond quickly to interaction from the visitors. It has been shown that most visitors to a site will leave and not come back if it takes more than twenty seconds for a page on the site to display (Loiacono, Watson, & Goodhue, 2001).

### **5. Design appeal.**

The "graphical and textual stimuli" of a web site comprise its design appeal. A good web site must leave its visitors with a sense of comfort in order to encourage repeat visits. (Loiacono, Watson, & Goodhue, 2001)

### **6. Intuitiveness.**

The navigation of a good web site must be easy to learn and must feel natural (Loiacono, Watson, & Goodhue, 2001). For our web site in particular, students must be able to navigate around only having general computer knowledge in order to not waste valuable class time.

### **7. Visual appeal.**

The visual appeal of a web site refers to two aspects: atmospherics and complexity. Atmospherics are components of the site that are tailored for specific emotional affects. Atmospherics include colours, text, audio, and graphics on the site. The atmosphere of a site

must make the visitor comfortable and must not distract the visitor from the site's content. The complexity of a good web site must be of an appropriate level. It has been shown that a site with pages of moderate complexity best holds a visitor's attention. Too much complexity confuses a user and too little does not keep visitors interested. (Loiacono, Watson, & Goodhue, 2001)

#### **8. Innovativeness.**

A truly good web site must be innovative. The content of the site as well as the way in which the content is presented must be unique and creative. (Loiacono, Watson, & Goodhue, 2001)

#### **9. Flow-emotional appeal.**

“Flow-emotional appeal” is the most difficult aspect of a web site to plan for, yet is the most important aspect, since it is the end result of a site that scores well in all other quality measures listed (Loiacono, Watson, & Goodhue, 2001). A good web site must offer seamless interaction, must be enjoyable for its visitors, and must ensure that its visitors do not feel self-conscious (Hoffman & Novak, 1996).

#### **10. Viable Substitute.**

A web site might be a viable substitute to off-line activities if the web site has similar functionalities with the more traditional tools and the web site offers advantages that its off-line counterpart cannot provide. These advantages can range from higher effectiveness to lower cost.

### **2.5: CONCLUSION**

Our literature review covered historical information and interesting facts and stories about the Roman Forum, the San Clemente church, and the San Giovanni Laterano church, as well as information about how to develop an effective educational web site that is easy to access

and that that would appear interesting to web site visitors. The literature sources argue that the most effective way to gain the interest of a viewer is by presenting information chronologically through storytelling. This concept was applicable to our virtual tour. To make the tour interesting to students, we had to tell interesting stories about the Roman Forum and the two churches.

After the web site was completed, we had to ensure that it was helpful as a teaching tool by selecting a number of British teachers to assess the web site. Our literature review on web site assessment provided information and tools to effectively perform this evaluation. We now had clear objectives for the site's development process, and were prepared to begin the design and implementation of an effective and informative educational web site for the Conway Library.

## Chapter 3: Methodology

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### 3.1: INTRODUCTION

The methodology to achieve our objectives involved of six chronological steps: gathering information from the Conway Library staff, designing a user friendly website, developing the site, testing the site, assessing the site, and generating an instructional manual for the Conway staff.

Our strategy included triangulating with different methods for two reasons. First, by looking for synergy among the results of our methods, we could more readily see where errors were made in our methods by noticing inconsistencies in the results. This would reduce the error in our evaluations. Secondly, by having more than one method, we had a fallback plan in case one of the methods failed completely. (Berg, 2001, p. 4)

### 3.2: INFORMATION GATHERING

Before we started designing the system, we needed to gather information from the Conway Library staff about their expectations of the web site and their database system, and the computer software and hardware available at the Conway Library. A focus group with the library staff was our primary method to collect information about the library and the project's requirements. We also conducted follow-up interviews with Conway staff that were able to provide us more in-depth information that was missed during the focus group.

#### **Preliminary Focus Group Interview**

During our first week at the Conway Library, we held a preliminary focus group discussion that included the Conway Library staff that might provide useful information about our project. Our goal in this phase was to gather specific requirements for the web page from the project sponsor and expectations about the content and presentation of the completed page. We

asked direct questions about what features the sponsor would like to see in the virtual tours. We also needed information about Conway's current computing environment, such as its database system, computer specifications, and available software. Our liaison at the Conway Library, Dr Lindy Grant, was not technically inclined; therefore, we avoided using computer science terminology during questioning.

We selected a focus group as the method for this phase of our methodology for specific reasons. A focus group session had the advantage of allowing us to witness the interaction of the participants (Berg, 2001, p. 115). This interaction took the focus group in directions that any one of the participants or researchers would not have thought to take it. Ideas from one participant triggered reactions and new ideas from other participants. (Berg, 2001, 112) As Rubin and Rubin (1995) explain in Berg (2001, p. 115): "In focus groups, the goal is to let people spark off one another, suggesting dimensions and nuances of the original problem that any individual might not have thought of. Sometimes a totally different understanding of a problem emerges from the group discussion." We felt this was very important in our case because we believed that no one person yet had a complete vision of the web page that would be created. By bringing everyone together into one group, for example, Dr Grant was aware of the technical limitations of web page technology and the Conway Library's computer system because Mr Griendly was present to warn her about these limitations. Thus, we could all have a complete vision for the first time of what was possible and what the web page would become.

Members of the Conway library staff who were present at this focus group were Dr Lindy Grant, Eva Bensasson, and Neil Griendly. They were purposively selected because of their pertinence to our project. Dr Grant, our project liaison, was included in this focus group because she was the initiator of our project and would decide what features should be included in the web

site. She was the individual whom we reported to during the development of the web site, and she was whom we were dependent upon for access to the rest of the staff. Neil Griendly was in charge of the Conway Library computer system, and Eva Bensasson was the Courtauld Institute's web administrator. We expected these two individuals to provide information about Conway's computing environment.

Two researchers attended the focus group. Andy Budiman acted as the moderator, and Intaik Park recorded conversations and group dynamics using field notes (Berg, 2001, p. 124). The moderator attempted to conduct the focus group session as informally as possible to encourage the participants to speak freely (Berg, 2001, p. 111). The two researchers dressed formally, in suit jackets and ties, however, to portray an image of professionalism (Jamison, 2001).

### **Follow-Up Interviews**

Following the preliminary focus group interview, we conducted individual interviews with certain individuals to acquire information that we felt pertinent to our project, but were missing in the focus group. To find more information about Conway's present image catalogue system, the audience of the web site, requirements for the web site, and potential assessment research sample, we consulted Dr Lindy Grant. To acquire information about Conway's current networking, hardware, and software specifications and limitations, we interviewed Mr Neil Griendly. To learn about Conway's current database management software, we consulted Courtauld Institutes' Director of Digital Media, Mr Tom Bilson.

Our most important finding in these follow up interviews regarded the Conway's present database management system. The Conway database program, FileMaker Pro, would not be sufficient to deal with Conway's future web site operations. It was also unsupportive to our

development of the virtual tour. Therefore, we needed to convince our sponsor to switch its database management program to Microsoft Access. The consequence of switching to Access required us to create new functional Access database interfaces that shared a similar look with the older FileMaker Pro interfaces. More details about our findings on Conway's database management system are discussed in Chapter 4.

### **3.3: WEB SITE IMPLEMENTATION**

#### **System Design**

After we gathered all essential information, we started the designing phase for a user-friendly and interesting web site with virtual tours. In the design phase of software development, we defined the goals of the web site system and decomposed this system into subsystems (Bruegge & Dutoit, 2000). The subsystems were the user interface, the database management system, and the communication system between the interface and the database.

The goal of the user interface (the web site) was to present the contents of the Conway Library's digital image collection in a logical and timely manner. This subsystem had to meet the assessment criteria defined in the web site assessment section of this chapter.

The goal of the database management subsystem was to store the digital images and web page content, and to rapidly retrieve this information on demand. The database must not have had inconsistencies or redundancies, to ensure that the information was consistent and accurate.

The goal of the communications subsystem was to connect the other two subsystems, allowing the user interface to retrieve its content from the database. This system must not have slowed down the performance of the user interface or the system as a whole: web pages must have responded quickly to user interaction, as shown in the web site assessment section of this chapter.



Based on Dr Grant's web site requirements and the criteria of the sub systems, we designed a prototype of the virtual tour. Details on the virtual tour design are discussed in the Chapter 4.

### **System Development**

After we designed the web site subsystems, we developed these subsystems based on our design and integrated them into a working whole, writing the programs that made up the web site. The goal of this phase was to create software that met the criteria that we carefully planned in the design phase (Bruegge & Dutoit, 2000).

The Conway Library owned computer applications that allowed us to develop the web site. The user interface was a web site presented on user screens in a web browser. Our project involved linking images to plans, sections, and elevations of buildings and archaeological sites. The web site browser performed this linking using image mapping technology, which was built into the web standard. The library had the license to use Microsoft FrontPage, a web-authoring tool that eased the process of coding the web site program.

The database management system that we believed to be the most effective for web site development and future operations of the Conway Library was Microsoft Access. Microsoft Access communicated well with Microsoft Internet Information Server, a web server system built in to Windows 200 Server (already present on the Conway server), which was a computer program that delivered web pages to users when demanded. This web server system connected the communication between the Access database and web pages. For example, when a user who wished to search for an image using Conway's search engine, the web page image that the user would like to view was stored inside the database. The web server system processes the search engine's request for this image and acquires the appropriate image from the database.

## **Prototype Assessments**

During the development phase of the virtual tour, we carried out three types of assessment of the prototype. The goals of these assessment methods were to acquire research participant's opinions and to identify improvements to be made to the prototype. The three assessment methods were a focus group interview with secondary school students and teachers, and two ethnographic interviews with a secondary school student and an art and architecture professor. Dr Grant provided us with the participants, who were not statistically valid samples. Nevertheless, these samples were still valuable since the prototype assessments were not quantitative research methods, but qualitative ones, conducted to obtain in-depth information about the prototype.

### **Interview Background.**

Prototype assessments were designed to obtain information from participants who would be the audience of the virtual tour. The interviewees for the first research were six students with art and history background, and two teachers, all from the London Nautical School, who visited the Conway Library on May 22<sup>nd</sup>. The second prototype assessment took place on June 1<sup>st</sup> involving a 13-year secondary school student, Max Kelen, whom we visited at his home. Dr Richard Plant, who visited our work area in the Conway Library, participated in the third prototype assessment, which happened on June 11<sup>th</sup>.

The participants of our prototype assessments were not selected statistically. The London Nautical School students were not randomly chosen as participants, but rather their schoolteachers, who were contacted by Dr Grant, selected these students. For the interviews with singular participants, Max Kelen and Dr Plant, Dr Grant also provided us with these samples. The samples of our assessment research did not represent a larger population, such as

all secondary school children in the UK, or every art and architecture instructor in Great Britain. Even so, the in-depth information offered by these interviewees was valuable in the development of the virtual tour.

Three researchers attended the three assessment research sessions. Tim Garthwaite acted as facilitator, while Andy Budiman and Intaik Park observed and recorded conversations using field notes. During these information-gathering sessions, the facilitator attempted to draw information from the participants, specifically trying to ensure that they were all participating in the group. The facilitator also conducted the session as informally as possible to encourage participants to speak freely. All three researchers were dressed formally, in suit jackets and ties, however, to portray an image of professionalism.

### **Information Gathering Protocol.**

#### Research Objectives

1. To obtain in-depth information from secondary school students regarding their preferences on an educational web site.
2. To obtain in-depth information from the schoolteacher about functionalities they would like to see and use in an educational web site.

#### Research Structure

1. Group interview directed as a conversation with purpose.
2. Direct questions to obtain informational meanings.
3. Facilitator acted as an expert on the subject of web development, but was still interested to learn about participants' opinions on the developing web site (sophisticated sympathetic role).

## Research Schedule

1. Applied the Social Exchange Theory in introduction: explained the purpose of the group interview, how the interviewees would benefit from the research, and expressed gratitude to interviewees for participating in the research.
2. Obtained brief information about the background information of the participants such as the students' age range.
3. Let the participants tried out the early prototype of the virtual tour.
4. Brief opening statement directed to students and instructors:  
“Now that you have tried our prototype, we would like to know what you think about the web site. Which part of the web site do you enjoy most?”  
Probe: → Which parts are interesting?  
→ Which parts are boring?

## Questioning

For instructors and students:

“ Is it easy to surf your way through the web site?

Probe: → Do you find any problem to go in or out of a page?

For students:

“Is it easy to understand all of the information in the web site?”

Probe: → Are there words you don't understand?

“ What other things would you like to see in the web site to make it more interesting?”

Probes: → Would you like to read more stories behind the objects?

→ Do you want to see more pictures?

For teachers:

“What other features would you like to see in the web site to make it a useful teaching tool?”

Probes: → How would the web site be useful in your teaching?

The results of these assessment researches and how they affected the development of the virtual tour prototype are discussed in Chapter 4.

### **Web Site Building Procedure**

According to Dr Lindy Grant, the objective of this project was not only to create a functional and useful virtual tour, but also to create a simple procedure to construct this virtual tour so that non-computer trained Conway staff members would be able to build the virtual tour. The Conway Library had a minimal number of staff members who were technically trained to lend computer technical support. Therefore, our procedure of virtual tour construction would have to be clear enough to be carried out by the staff members with minimal experience in web site development.

The development of the virtual tour itself was not entirely simple and easy to carry out. The virtual tours utilized web site technology such as image mapping, image editing, image layering, database connection, and other computer processes, which our sponsor was not familiar with. These processes needed to be carried out in order to create a virtual tour that included all the functionalities established as requirements by Dr Grant. To simplify this complex process, we created a step-by-step procedure allowing a web site administrator to create a functional virtual tour and apply changes to the virtual tour's contents when necessary. This simplified procedure is discussed in Chapter 4.

## **System Testing**

After we finished developing the web site, we tested it to ensure that the site was error free and met the requirements as we understood and defined them in the design phase (Bruegge & Dutoit, 2000). During this phase, the emphasis was not on an assessment of web site quality, but on its functionality: whether or not it worked the way *we* designed it to work. During this phase, we tried to do as many things as possible to the web site to find any errors that may have existed in the program, or design flaws that we did not foresee in the design phase. If errors were found, or if the system design was not adequate, we moved back into the design and development phases, altering the design and the programs to meet the needs of the system that were found in this testing phase. This cycle was repeated until we had a working web site system that was error free and met the design criteria of our sponsor. All that would be left was to have those who would be using the system, art and architecture teachers, assess the quality of the system.

### **3.4: ASSESSMENT OF WEB SITE QUALITY**

The web site assessment was a critical step to achieve our objective of creating a web site that was an effective teaching and learning tool. The evaluation would show whether the site met the needs of the audience of the web site, the secondary students and teachers. We triangulated the assessment by using multiple data gathering methods in order to minimise bias and error (Berg, 2001, p. 5). Our primary method was a survey, but we also implemented ethnographic interviews with the students and teachers. If the survey was inadequate for any reason, we still had these participatory interviews for the assessment.

## Web Site Quality Survey

The administration of the survey with students and teachers who were the potential users of the web site would give us a quantitative basis for our assessment. We tried to gather the opinions of the participants with our survey tool. The information that we desired in the survey in order to assess the quality of our web site in context is detailed in the “Web Site Quality Assessment: WebQual” section of our literature review. The survey tool itself is included in the Appendix. In order to administer an effective and useful survey, we must be careful with the way in which the survey was created and presented.

### **Sample selection.**

Due to the circumstance in the British education system (i.e. final examinations during the time of research), our sponsor was unable to provide us with a statistically valid sample for the WebQual survey. The sample of the WebQual research would be students and teachers from London Nautical School, the participants of the prototype assessment research. Dr Lindy Grant contacted the London Nautical School, and the teachers and students agreed to visit the Conway Library once again on June 21<sup>st</sup>. This selection of survey sample removed our own self selection bias as researchers, but we would have to report and account, in our analysis of survey results, for the selection bias of Dr Grant, who would select teachers who would give the results she wishes to see in the survey, whether she was conscious of this selection bias or not. In this case, we would not try to extrapolate the results of the survey and apply them any further than the members of the sample itself. In other word, the results of the survey did not represent the opinions of *all* secondary school students and teachers in London.

We created the web site assessment survey carefully to ensure that it would provide us with useful and useable information about the students and teachers' opinions on the web site.

The wording of the questions and structure of allowable replies, the ordering of the questions, and the way the survey tool was presented to the students and teachers, were all important. In order to ensure that the survey gathers results that were meaningful, we must also pre-test the survey.

The wording of the questions and the way the participants were allowed to answer those questions were critical to the success of our survey. We must be careful with inter-subjectivity; that is, we must ensure that the questions meant the same thing to the teachers that they meant to us, and that the teachers' responses to those questions meant the same to us that they meant to the teachers. We needed to ensure that the questions did not evoke an emotional response that would affect the answer, as in "Isn't our web page the best looking page you've ever seen?" The questions could not be complex, which would cause confusion and would make it difficult to discern what the informant meant in their response. The questions must also involved only one aspect of web site quality each, so that meaning could be taken from the answers directly. The responses must be forced into discrete answers so that the measurement could be used directly in our analysis. The idea was to force qualitative information about the quality of the site into a quantitative measure, which could be used for comparison and easy analysis.

The presentation of the survey was also an imperative consideration. Participants were invited to explore the web site, taking a virtual tour of the Roman Forum and the San Clemente church. When the tour was completed, they would be directed to the survey.

The order in which the questions appear in the survey tool was important. The most straightforward or interesting questions to secondary school students and teachers, such as "Do you have an Internet connection in your classroom?" or "The web site is creative," should be listed first in the survey. The most difficult questions were the ones that required cognitive



thought, such as “The web site is easier to use than the currently recommended method of teaching art and architecture in the National Curriculum, using posters and transparencies,” which required the participants to compare two complex learning methods. These questions should be found in the middle of the survey. Finally, the most affective or subjective questions, which would require emotional response from the teachers, should be listed at the end of the survey. An example of one of these questions is, “I feel cheerful when I use the web site.” We should not, however, adhere too strictly to this ordering in every case, because we would ensure the results are falsifiable by asking the same questions three times with different wording. This would allow us to discredit inconsistent responses during analysis of the survey’s results.

### **Survey error.**

Four types of error applied to our web site assessment survey and its administration: coverage error, sampling error, measurement error, and non-response error. Since the sample of the WebQual survey was not statistically valid, the survey was a subject to these errors. We must be constantly aware of these errors and must account for them when and where they were discovered.

Coverage error is the overlooking of a subgroup of the reference frame in our sample (Jamison, 2001). For example, if the teachers in our sample were under thirty years old, this would not be a sufficient representation of the entire frame since many secondary school teachers in England are over thirty years of age, and age may be a major criterion for whether a teacher finds the web site to be useful.

Sampling error occurs when the probability of a member of the reference frame being selected for the sample is not equal for all members of the reference frame (Jamison, 2001). Since Dr Grant selected the members of our reference frame directly, we would have to identify

and account for her selection bias (see “Survey sampling,” above). We would not be able to quantitatively extrapolate and apply the results of our survey data to a larger population in this case.

Measurement error is a communication error between the survey creators and the survey participants; it occurs when one side of this social exchange misunderstands the meaning of the other side’s questions or responses. We would account for as much measurement error as possible by pre-testing our survey with two groups: students and our sponsor. In this pre-test, we would try to ensure that our questions’ meanings were clear for art and architecture teachers, and that the responses they were allowed to make in the survey were indicative of the meanings we wished to gain in the analysis of the responses (Dillman, 2000, p. 140). The information that the WebQual instrument was trying to gather was extremely clear to us (Loiacono, 2001); we ensured that the questions and possible responses were clear enough for the respondents to give us the information we thought we were gathering (Jamison, 2001).

Non-response error is the error inherent in a voluntary survey because all respondents cannot be expected to complete the survey (Jamison, 2001). The possibility for this type of error was minimal in our survey since the teachers and students from London Nautical School had expressed their will to participate in the virtual tour assessment research. Nevertheless, if the number of responses were less than the number of sample, we would need to account for non-response error.

### **Survey administration.**

After the survey was complete and pre-tested as discussed in “Survey error,” above, we administered the survey two groups: students and teachers. We used two slightly different types of questionnaire during the administration of the survey to the two groups.

The questions which were slightly different in the two types of questionnaire were the ones involving two different functions of the web site for students and teachers. For example, the questionnaire for the teacher asked, “Is the information on the Web site pretty much what I need to carry out my teaching?” while the questionnaire for the students enquired, “Is the information on the Web site pretty much what I need to carry out my learning?”

The survey was presented in a way that made the participants felt they were spending a short amount of time (minimising the subjective or direct costs of taking the survey) to perform an important service that would benefit them as directly as we could make it seem (maximising the benefits of taking the survey).

After this assessment research was completed, we sent thank-you postcards to the London Nautical School, to show our appreciation to the teachers and students who had participated in our research.

### **Ethnographic Interviews of Students and Teachers**

Ethnographic interviews with secondary school students and teachers gave us in-depth information about the participants' opinions and feelings toward the web site. Ethnographic research is a process of gathering systematic observation, partly through participant observation and partly through conversational interviews (Berg, 2001, p. 139). In our ethnographic interviews, we observed the participants while they were using the final version of the virtual tour and asked them similar questions that we used in the survey (Vinten, 1987). This combination of observation and interview allowed us to observe more in-depth information and latent opinions of the participants that might be missed during the survey (Whittenburg & Shedletsy, 2000).

The participants of our research were secondary school students and teachers from two

different schools. As mentioned in the discussion of previous researches, the sample was provided by Dr Lindy Grant, and was not a statistically valid sample.

Ethnographic research consists of two general aspects: observing participants' activities and conducting interviews afterward (Berg, 2001, p. 155). Both aspects took place in Conway Library where the virtual tour was run on two computers: Conway's Viglen server and a laptop computer.

### **Observation and interviews.**

Two researches observed the participants' behaviour while they interacted with the web site. One researcher took field notes about what the students and teachers were doing with the web site, while another researcher noted body movements, such as finger tapping, head nodding or shaking, and facial reactions such as smiling or brow furrowing, which can reveal a participant's emotion toward the web site (Berg, 2001, p. 90). These field notes allowed us to compare the times that emotional reactions happened with times when the participants were at specific places on the site or performing specific actions such as mouse clicks. Therefore, we could correlate their reactions with their use of the site, such as finger tapping during a page transition, and hypothesise a cause for each reaction, such as frustration due to slow system response.

While the students and teachers were using the web site, and after they have finished using the site, we asked the questions to the participants in order to gain more in-depth information from the participants. The results from these interviews complemented our survey by providing a context behind the participants' responses to the questions listed in the survey. For example, in the survey, we asked the participants whether they thought the information on

the web site was effective. In the ethnographic interviews, we could learn the reason why the students and teachers found that the information was effective or not effective.

We included four types of questions in the ethnographic interviews: essential questions, probing questions, extra questions, and throwaway questions (Berg, 2001, p. 75). Essential questions garner the information we need to assess the web site. Probing questions are prompted by interviewees' responses, and are used to gain more depth about their previous responses. Extra questions are the same as the essential questions but asked in different manners and at different times to ensure consistency in the respondents' answers. Throwaway questions are filler to keep conversation flowing. (Berg, 2001, p. 75)

The ordering of the questions used in the survey also applies in the interviews. We asked the questions most interesting to the participants first, followed by the most complex questions, and finishing with those questions that were the most subjective, or affective. (Jamison, 2001)

The way the participants in the ethnographic interviews perceived us as researchers was important to gain an accurate picture of what the students and teachers thought about the web site (Jamison 2001). We must appear professional so we dressed in formal suits. We carried clipboards for field notes and brought extra pencils, pens, and paper. In this way, we hoped that the students and teachers would feel that our research was important and that they should participate, and we would also ensure that we were well prepared and that a lack of supplies did not confound the interviews.

According to Berg (2001), there are two types of ethnographic research: covert and overt. In covert observations, the researcher conceals his or her true identity, while in overt observations; the researcher reveals his or her identity (Gamson, 2000). In our project our research was overt since our identities were revealed to the interviewees. During the initial

contact with the London Nautical School, Dr Grant introduced herself and our role as developers of the virtual tour.

There are disadvantages in an ethnographic research. First is the *Hawthorne effect*: when the subjects realise that they are being observed, they will alter their behaviour. To make this effect disappear, a research must take place in a long period of time, and the researchers must become invisible to the participants by fusing into the subjects' group for an extended period of time. (Berg, 2001, p. 147) Our research on assessment has a strict time limitation; therefore, the *Hawthorne effect* is still a factor that needs to be accounted for during analysis. Another disadvantage is the data gathered in observations, such as hand movements and facial reactions, are often hard to be categorised (Griffin, 2001). For example, we could not be absolutely sure that finger tapping indicates a bored subject.

### **3.5: MANUAL FOR CONWAY LIBRARY STAFF**

When the web site was completed, we generated a manual for the Conway staff that clearly articulated the procedure of image mapping and the development of quality educational web pages. The previous WPI IQP group created a manual for the Conway Library staff about how to manage the database and how to add the contents of the database to their web site. We had a digital copy of the manual and received permission from them to use it as a basis for our own manual. The manual we created contains detailed instructions on how to link the plans and images in the database together that a non-technically trained individual could use as an instruction manual to create a virtual tour. The library staff would use this manual as the rest of the Conway Library photograph collection was digitised to make the photographs available for use by secondary school art and architecture teachers in the classroom.

### **3.6: CONCLUSION**

In this project we created a user-friendly and error-free web site and we assessed it using multiple data gathering methods, analysed the results, and drew a conclusion whether the site's audience, the secondary school students and teachers, found the web site desirable and advantageous. We also produced a user manual which would guide the Conway Library staff to extend the site by adding to the existing web pages and creating new quality pages.

## Chapter 4: Findings and Results

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This chapter discusses the findings of our research and the results of our project such as the web site design, the final version of the virtual tour, and the web development procedure we created for the Conway staff.

### 4.1 INFORMATION GATHERING

The information that we gathered from the Conway staff was the specifications of available computer hardware and software, and the requirements of the virtual tour set by our sponsor.

#### Conway Computing Environment

Information regarding the Conway Library computing environment were collected through observations and a focus group with Conway's technical staff members. Specifications on computer hardware and software were acquired through observations. Information on database management system was gathered through a focus group with Mr Neil Griendly and Mr Tom Bilson.

#### Server Hardware Specification.

The Conway Library server hosted the library's database of photographs and catalogue. The server machine was a Viglen LX3 Server model, equipped with a Pentium III 800 Mhz processor, 1024 MB of RAM, and 60 GB of hard drive. The server was sufficient to deal with the library's database operation which was mainly in the forms of storing new images into the hard drive, adding information about the new images (cataloguing), and browsing and searching for information.



## **Software and Database Management System.**

The Viglen server ran the Windows 2000 operating system where we installed the required software to run the image database and the virtual tour was installed. The library staff members maintained their image database by using the FileMaker Pro 5 database management system. The Conway Library began using the FileMaker Pro 5 when the library needed to switch from its older database management system, Dbase, a non-Y2K compliant application. According to Mr Bilson, the decision to choose FileMaker Pro 5 as a preferable database management application was based on the familiarity of the Conway staff to the FileMaker Pro series. With previous experiences of using FileMaker, the Conway staff would be able to move its older database into an Y2K compliant system more effectively and promptly.

The FileMaker database interface allowed the Conway staff to add new photographs and descriptions, and browse and search existing records. Although the FileMaker system could handle these operations adequately, we believed that Microsoft Access was a more suitable database management program for Conway's future online operations such as hosting the Conway web site, search engine, and the virtual tour. Comparison between FileMaker Pro and Microsoft Access is discussed on the next page.

Table 4.1: FileMaker Pro vs. Microsoft Access

	<b>FileMaker Pro</b>	<b>Access</b>
<b>Popularity</b>	FileMaker is not as popular as Access. Most likely, users will not be familiar with FileMaker, so they will need to learn about this program before starting to work on any sort of development.	Access is the de facto standard among the database programs utilized by small office and home users. Most database developers are competent in using this program. Access also includes a detailed and easy-to-understand "Help" file, so that inexperienced users can start working on an actual Access database in little time.
<b>Web Compatibility</b>	We could not make FileMaker Pro work with ODBC, which allows us to get the data inside the database to be used in the virtual tour.	We created a prototype of the virtual tour that actually works utilizing an Access database in one day.
<b>Server Administration</b>	To run a web page based on a FileMaker database, the server administrator needs to open the FileMaker database and run the Claris homepage.	To run a web page based on an Access database, the server administrator only needs to run the Internet Service Manager (ISM), which is integrated in the Windows 2000 Server operating system already in place in the library. Since Microsoft made this operating system as well as the Access software, these two systems work best in combination. Also, ISM provides a simpler and easier developers' interface.
<b>User Interface</b>	If we continue to use FileMaker Pro, database users can continue to use the interface developed by the previous WPI project team.	If we switch to Access, we need to rebuild the user interface, and the database users might need to familiarize themselves with the new interface.
<b>Maximum number of concurrent users</b>	FileMaker Pro allows only five concurrent users. To accommodate more than five users.	Access can accommodate an unlimited number of concurrent users.

Microsoft Access and FileMaker Pro had advantages and disadvantages, but for our project and for any future work on the digital collection and web site, Access was the preferable database management system. In the course of creating the virtual tour, we found that the

development of web pages based on FileMaker Pro required more time and was less flexible. On the other hand, the Conway staff members were already comfortable with the FileMaker Pro interfaces to search and browse data. Therefore, to ease the shock of switching from FileMaker to Access, we built an Access database search and browse interfaces that had the same look and functionality as the current FileMaker interfaces. We also recreated web pages developed by the previous WPI group, including the search engine, to work with the new Access database. Thus, the previous WPI team's older web page and the new web pages that we developed worked simultaneously in one Access database and could be easily interconnected in one congruent web site.

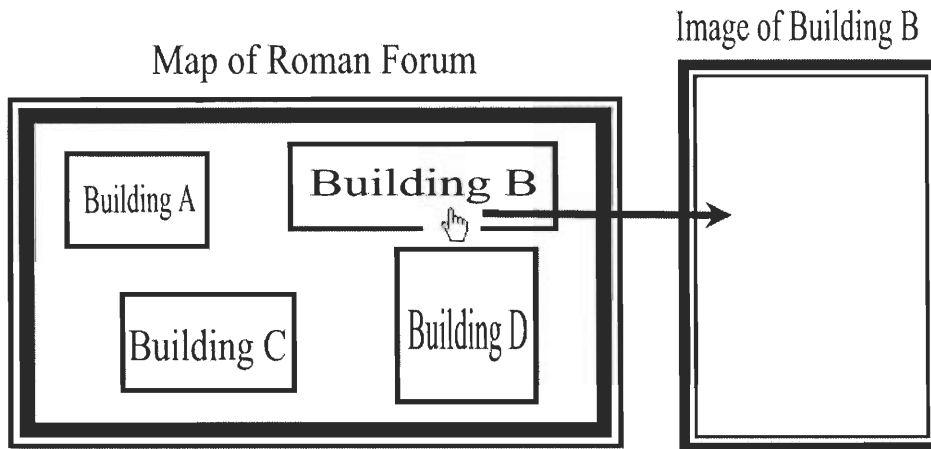
We presented our argument for Microsoft Access to our sponsor, Dr Grant, and other Conway staffs who were related to the library's database maintenance. The Conway staff agreed that Microsoft Access was more suitable for the library's future operations and they were willing to switch from using FileMaker Pro to Microsoft Access. One issue that the staff concurred with and the issue we had to keep in mind was the switch to Access must be as invisible as possible. In other words, the Conway staff must be able to use the new interface without having to go through a learning curve. All the functionalities of the FileMaker Pro must be functional also in the new Access interface. The looks of the new Access interfaces must also share the look of the FileMaker interfaces.

### **Requirements from Sponsor**

Based on discussions with Dr Grant, we believed that our ideas about the requirements for the virtual tour still concurred with the actual requirements of our sponsor in London. Our sponsor would like a technology that allowed hyperlink mappings on digitised images. By using this technology, the Conway staff would be able to link an object inside a plan, section, or

elevation to an appropriate image from the library database. A simple example of image mapping is shown in Figure 4.1.

Figure 4.1: Example of Image Mapping



Hyperlinks are mapped on objects inside the map of the Roman Forum: Building A, Building B, Building C, and Building D. When a user clicks on Building B, the web browser displays a digitised image of Building B. This digitised image of Building B is retrieved from the database of digitised photographs.

Another requirement that we learned from our discussions from our sponsor was the simplicity of the image mapping procedure. Our sponsor wished that the process of mapping an image would be as straightforward as possible so that even the least technically inclined staff would be able to apply this technology in future projects. Another important part of our project is to generate a user manual explaining this process of image mapping in an intensive and straightforward manner.

Our sponsor requested that the virtual tour to be linked to the older Conway web pages developed by the previous WPI team. This previously developed web page displayed facts behind each photograph, such as the actual photograph's dimension, negative technique,

iconography, etc. Dr Grant requested that this web page to be linked with the virtual tour so that a user could view the facts behind each photograph displayed in the tour.

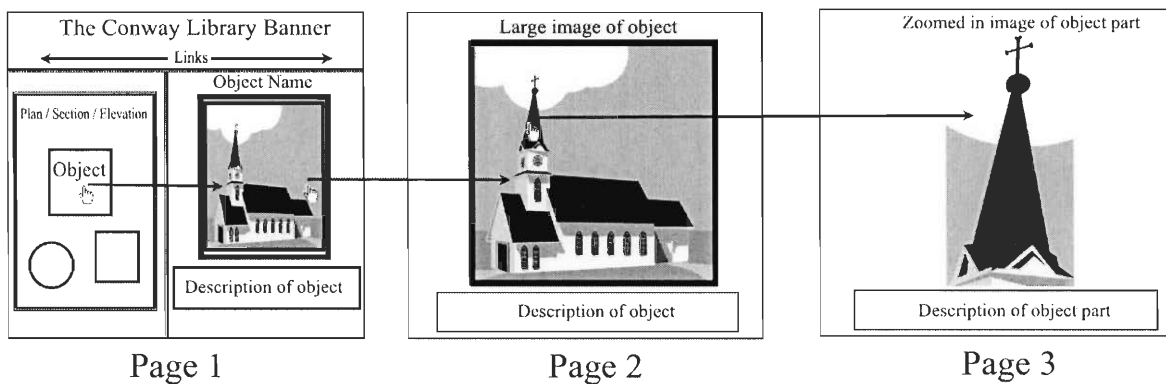
## 4.2 VIRTUAL TOUR IMPLEMENTATION

### Designing the Virtual Tour

Our sponsor gave us a freedom to decide the look and the functionality of the virtual tour. The virtual tour utilized image mapping technology to link maps, sections, and plans to images and also displayed stories and descriptions for each digitised image.

Our earliest design of the virtual tour layout is shown below (Figure 4.2).

Figure 4.2: Virtual Tour Design



Page 1 is divided into three sections: the banner (top), the plan/section/elevation, and the image sections. Besides the Conway Library banner, the top section also contains links to other web pages such as the news page, introduction to Conway Library, and the search engine. On plan/section/elevation a user can click on an objects where a hyperlink is mapped. For example (see Figure 4.2), when a user clicks on a church located inside a plan, an image of the church and its description is displayed on the image section. If a user wishes to view a larger size image of the church, he or she can click anywhere on the Page 1 image, opening the Page 2 window.

Page 2 contains larger size image of the object (in the example above, the church). Description of this image is located below the picture. On Page 2, a user is also able to click on

certain parts of the photograph to view a zoomed-in image of the respective parts. For example, a user can click on the spire of the church to view a closer image of the spire. This closer picture of an object part is located on Page 3. On this page, a description for the object part is placed below the zoomed-in image.

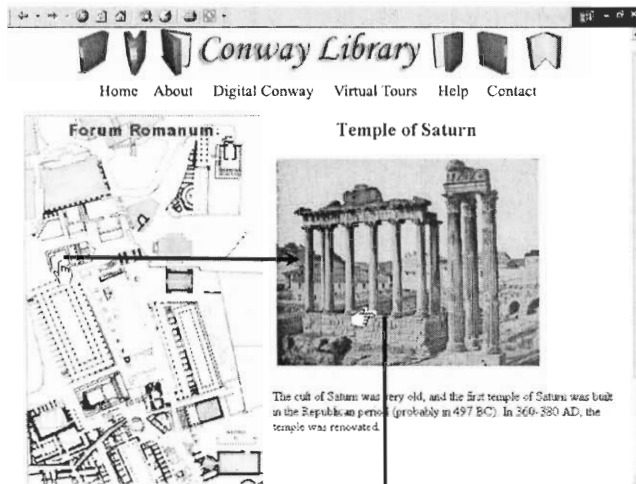
We attempted to design the virtual tour to be as straightforward as possible so that users with minimal experience in Internet browsing could still use the tour effectively.

### **Developing the Roman Forum Virtual Tour Prototype**

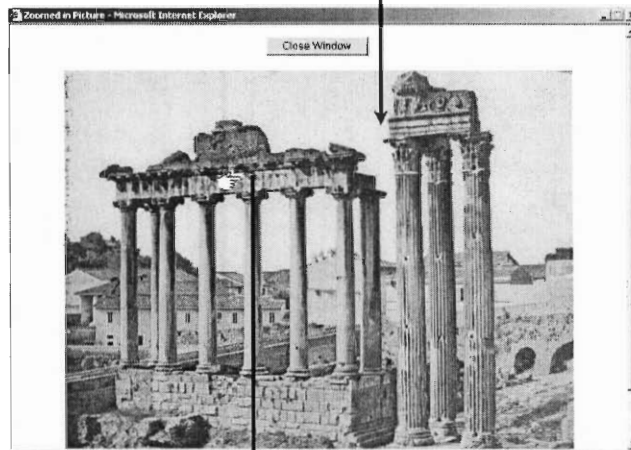
We developed a prototype of the Walk Around the Forum based on the design discussed above. For the Forum virtual tour, the plan/section/elevation section on Page 1 (see Figure 4.2) holds the plan of the Forum Romanum borrowed from Amanda Claridge's Oxford Archaeological Guide. This plan contains more than 40 buildings and monuments from the Ancient Roman era.

Figure 4.3 is the earliest look of virtual tour prototype.

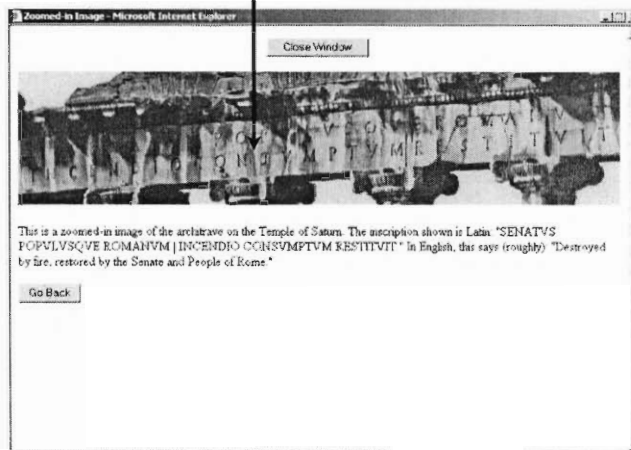
Figure 4.3: Early Prototype



Window 1



Window 2



Window 3

The layout of the prototype resembles the virtual tour design shown in Figure 4.2. In Window 1, the top section holds the Conway Library banner and links to the library's other web pages. A plan of the Roman Forum is located in the left section, and an image of an object is displayed in the right section. A user can view an image of a particular object by clicking on the object located inside the map. Objects inside the plan with photographs stored in the Conway database are coloured red. In the example above (Figure 4.3), a user clicks on the Temple of Saturn, which is located at the upper left part of the Forum, and an image of the Temple of Saturn is displayed in the right section. The user can click anywhere on this image to view a larger picture of the Temple of Saturn, which is displayed in Window 2. The user can click on certain parts of this larger image to get a zoomed-in view of the parts. For example, the architrave of the Temple of Saturn can be clicked on to get a detailed view of the architrave that is shown in Window 3. Window 3 also displays appropriate descriptions for the object part. In the example above, we translated the Latin inscription on the temple's architrave into English.

### **Prototype Assessment**

After an early virtual tour prototype was completed, we conducted an assessment research to obtain the opinions of potential users on the prototype and to identify possible improvements.

#### **Focus Group Interview with Students and Teachers.**

For this research, we invited six students and two teachers from the London Nautical School. The students, whose age ranged from 14 to 15, possessed art and history background. The teachers were Ms Lisa Wilson, an art instructor, and Mr Mark Yelland, London Nautical's Director of Studies and Learning Support. We let the participants used the virtual tour while we



observed their activities. After they were finished browsing the virtual tour, we interviewed the students and the teachers as a group.

The results of this research provided us with useful insights and recommendations.

Information obtained from this group interview is listed below.

1. Enjoyable parts of the virtual tour:
  - a. The map of the Roman Forum was useful to provide a clearer picture of the Forum as a whole.
  - b. The photographs in the virtual tour were very interesting.
2. User friendliness of the virtual tour:
  - a. Students easily understood and used image linking of map and photographs.
  - b. Students faced difficulties in zooming to a certain area in the photograph.  
They felt that areas that can be zoomed in should be clearly marked.
  - c. Students would like to see more detailed instructions on how to use the virtual tour.
  - d. Students faced difficulties to go back to “Home.”
  - e. Students faced difficulties finding the “mouse over” information on the map
  - f. Students and teachers emphasised the importance of having a clear introduction page.
3. Presentation of the virtual tour
  - a. Participants recommended a bigger and clearer Forum map.
  - b. Participants found the size of the font used in the prototype to be too small.
  - c. Participants would like to see more animation and sound in the virtual tour.
  - d. Students would like to see a background image behind the virtual tour.

- e. Teachers recommended posting some pictures of the actual Conway library.
  - f. Students suggested making the web page more colourful to obtain interest of younger students.
4. Content of the virtual tour
- a. Students found the descriptions of our prototype were generally boring. They would like to see more interesting facts of structures of buildings.
  - b. Participants would like to see more interesting facts on the buildings such how long it took to build the buildings, the function of a building during Ancient Rome, new discoveries, excavations, etc.
  - c. Participants would like to learn about facts behind the photographs.
  - d. Participants thought a map of Rome would be useful to show users where the Forum was located inside the city.
  - e. Participants would like to see artist renditions of how the ruins looked like during Ancient Rome.
  - f. Students believed a small Latin dictionary would be useful to explain the meanings of words inscribed on the Forum buildings and monuments.
  - g. Teachers would like the information on the Forum and its buildings to be grouped into subjects. For example, a geography teacher would be able to easily access the Forum's geographical information, and a history teacher could read historical facts on the Forum.
  - h. Students wanted to see more photographs of each building from different photographers and various points of view.

- i. Participants would like to read information about developers of the virtual tour.

From this research, we concluded these following points. The students would like to see more interesting content in the virtual tour, such as more photographs and the facts behind the images. The teachers preferred these image descriptions to be grouped into different subjects such as history, architecture, and photography. We also learned that instructions would be needed to show the users how to navigate the virtual tour.

### **Ethnographic Interview with Student.**

On June 1, Dr Lindy Grant provided us with another participant to evaluate the prototype of the Forum virtual tour. Max Kelen was a 13-year old student of Alleyn's School in London. At Alleyn's, English was Max's favourite subject. He also mentioned that he was not interested in history and had never studied art and architecture history. Like most of his schoolmates, Max was very much familiar with computer equipment and Internet surfing. Max owned a top of the line PC, equipped with Pentium 4 processor. Max frequently used his computer to play various computer games and often utilized the Napster technology.

In short, Max was a typical teenager from an upper-middle class family who was well educated, and computer literate. Although Max shared the same age range with the London Nautical students, Max did not have art and architecture background. Max, as a research participant, provided us with a different view toward art and architecture learning than the London Nautical students.

Another important reason why Max was chosen as a participant was because this research was conducted at Max's home rather than at the Conway Library. In assessment researches at the library, we were not able to assess the load speed of the web site. The computer used in the

research with London Nautical participants was connected with an extremely fast connection causing the virtual tour to load quickly. Average computers at schools or homes, like Max's computer, were only connected with slow 56K modem connection. By conducting the assessment with Max's computer with its slow Internet connection, we were able to get a better idea about the load speed of the virtual tour run on an average home computer.

Our research on Max was in the form of participative interview. We let Max surf the Conway Library web site and provided him with a hands-on experience on the virtual tour prototype. After Max finished browsing the web site, we asked Max a set of questions similar to the questions asked to the London Nautical students on May 22<sup>nd</sup>.

Below is the summary of our observation and Max's responses to our questions.

1. Max's education background

- Max was 13 year old.
- Max went to Alleyn's school in London.
- Max was a 9<sup>th</sup> grader (high school freshman).
- Max's favourite subject was English.
- Max was "not really into history."

2. Max's computer background

- Max owned a Pentium 4 PC.
- Max's monitor was 17-inch.
- Max's monitor displayed 800 X 600 resolution.
- Max's computer had a 56K connection.
- Max played a lot of computer games.
- Max surfed the web frequently.

- Max's friends were also familiar with the Internet.
- Only a few of Alleyn's classrooms had Internet ready PCs.

### 3. Max and the virtual tour

- Max seemed to find no difficulty in browsing through the web site.
- Max seemed not to notice the clickable architrave in the large Temple of Saturn image.
- Max did not appear to be interested in reading picture descriptions.
- The virtual tour seemed not to interest or impress Max.

### 4. Max's opinions on the virtual tour

- Max thought the virtual tour was fine, although he was not very interested in history.
- Max thought descriptions of the pictures were fine.
- Max thought the web site would be more interesting if it used sound effects.
- Max thought the web site loaded fast enough, although faster loading speed would be better.
- Max said he would be more interested in learning history by using virtual tours.

From the observation and interview with Max, we learned that the virtual tour was user-friendly and could be accessed by a computer with a slow connection in a reasonable time. We also learned that the virtual tour, when used in a classroom, might be able to increase the interest of students without art or architecture background to learn about art and architecture history.

## **Ethnographic Interview with an Art and Architecture Professor.**

Dr Richard Plant was a freelance art and architecture professor who had taught in University of London and Bowdoin College in Maine. The results from this information gathering session are discussed below. Dr Plant, as a university professor, provided us with a slightly different point of view than the London Nautical teachers.

### 1. Internet in University Classrooms

- Dr Plant never used the Internet in his classrooms.
- Dr Plant recommended students to visit certain web pages outside the classrooms, in the students' own time.

### 2. Dr Plant's opinion on the virtual tour

- The virtual tour was simple, very straightforward, and easy to navigate.
- The virtual tour was suitable for inexperienced Internet users.
- Dr Plant seemed to enjoy the pictures.
- Dr Plant believed that the virtual tour was an excellent teaching and learning tool for art and architecture students.

### 3. Recommendations

- Areas that could be zoomed in should be clearly marked.
- Although descriptions of pictures were important, they should not overwhelm or confuse readers.
- Glossary for technical terms would be useful for those without art and architecture background.

In summary, this research suggested that the virtual tour could become an effective teaching tool when used in a classroom or when recommended to an interested student. From

our observation and interview with Dr Plant, we also believed that the virtual tour was easy to navigate. Even so, we should provide more instructions to guide the users such as directions showing which parts of an object were clickable.

Although all of the insights we obtained from the three prototype assessment sessions were sensible, not all of the recommendations could be applied to the prototype. For example, sounds and animations would slow down the download speed of the overall web page. Artist renditions of objects, although very helpful and interesting to students, would require the library to hire artists to create these drawings.

Recommendations and insights that were useful and could be applied to the prototype were:

1. Information on objects should be grouped into different subjects such as history, architecture, and geography. With this information grouping, a history teacher for example, would be able to access historical information about the object.
2. Information on objects should be interesting and easy to understand.
3. Detailed instructions on how to use the virtual tour should be included inside each web page.
4. An object should have more than one photograph with different views of the object and by different photographers.
5. The font (the text) in the virtual tour should be larger to make descriptions more legible.
6. There should be a glossary for technical terms.

## Prototype Revision

Based on the assessment research results, we revised the virtual tour prototype. The improvements to the prototype are shown in figures 4.4 to 4.7.

Figure 4.4: Change in Font

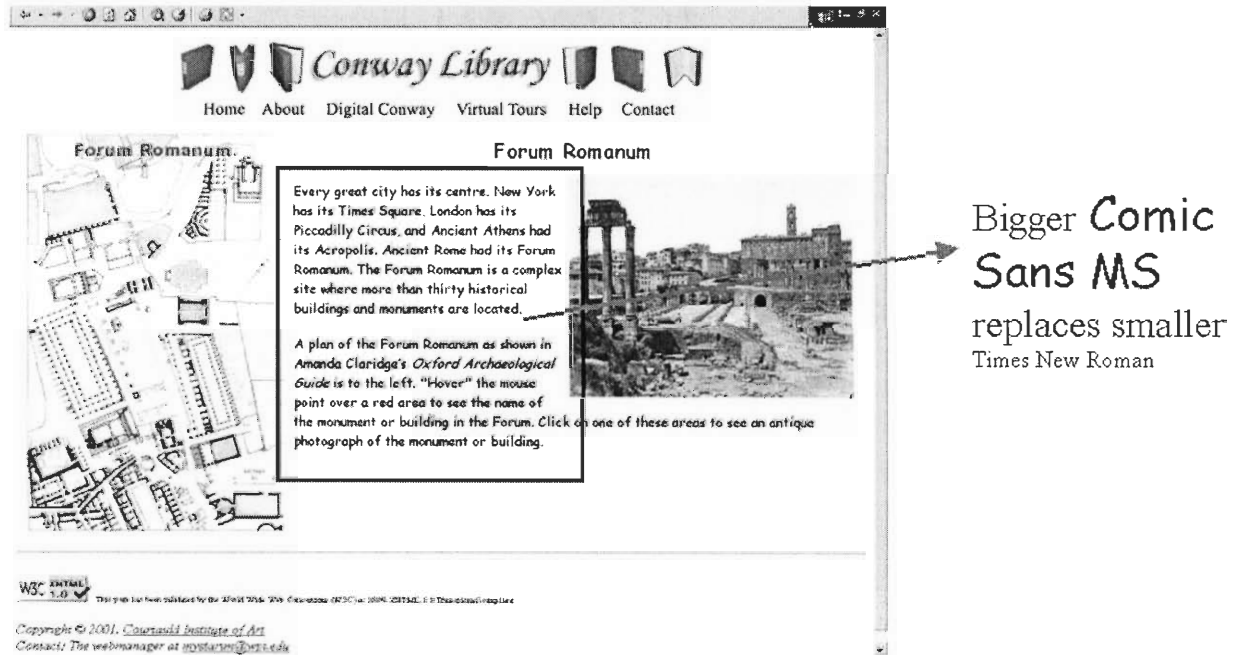


Figure 4.5: More Improvements on Prototype

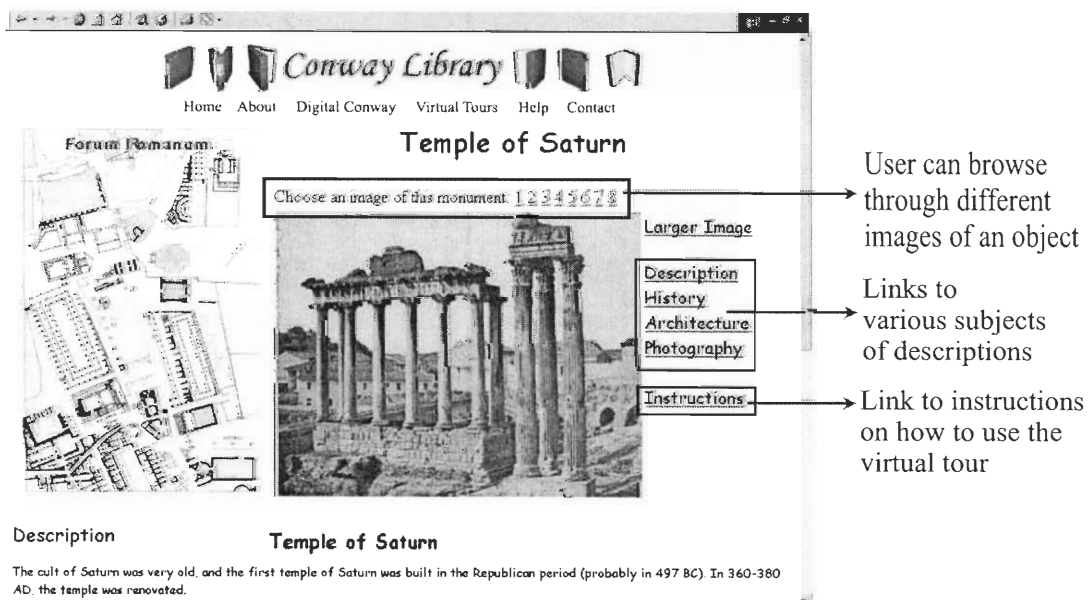
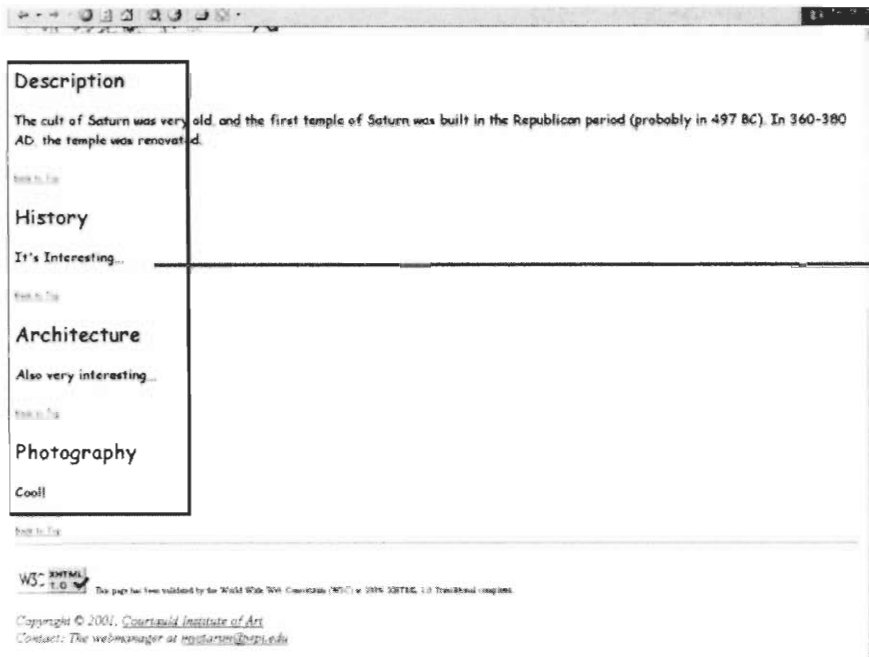


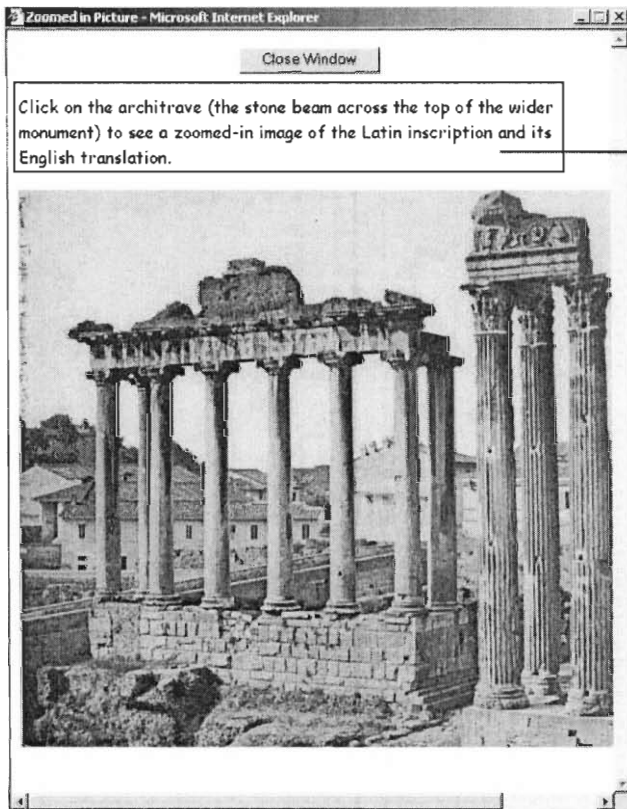


Figure 4.6: Grouping of Information



Object descriptions are grouped into subjects (History, Architecture, and Photography)

Figure 4.7: More Detailed Instructions



Directions on where to click on the larger image

## San Clemente Virtual Tour

After the Roman Forum virtual tour prototype was completed, we started the development of the church virtual tour. Dr Grant chose the San Clemente as a preferable building to be modelled in the virtual tour due to its relative simplicity compared to the San Giovanni church. Our sponsor requested that the virtual tour of the San Clemente included not only a plan of the church, but also a section where an object could be clicked on to display images of the particular object.

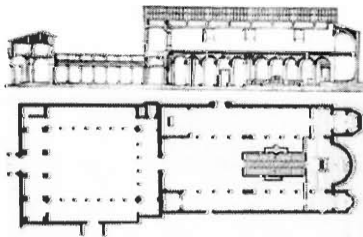
The layout of the San Clemente tour (Figure 4.8) resembles the design of the Forum virtual tour. The main page is divided into three parts: the top section where the Conway Library banner and links to other Conway's web pages are located. The left part of the page shows a plan and a section of the San Clemente church where red-coloured objects can be clicked on to display images of the particular objects.

Figure 4.8: San Clemente Tour Main Page

### *Conway Library*

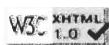
[Home](#) [About](#) [Digital Conway](#) [Virtual Tours](#) [Help](#) [Contact](#)

#### San Clemente



This is the church of San Clemente.

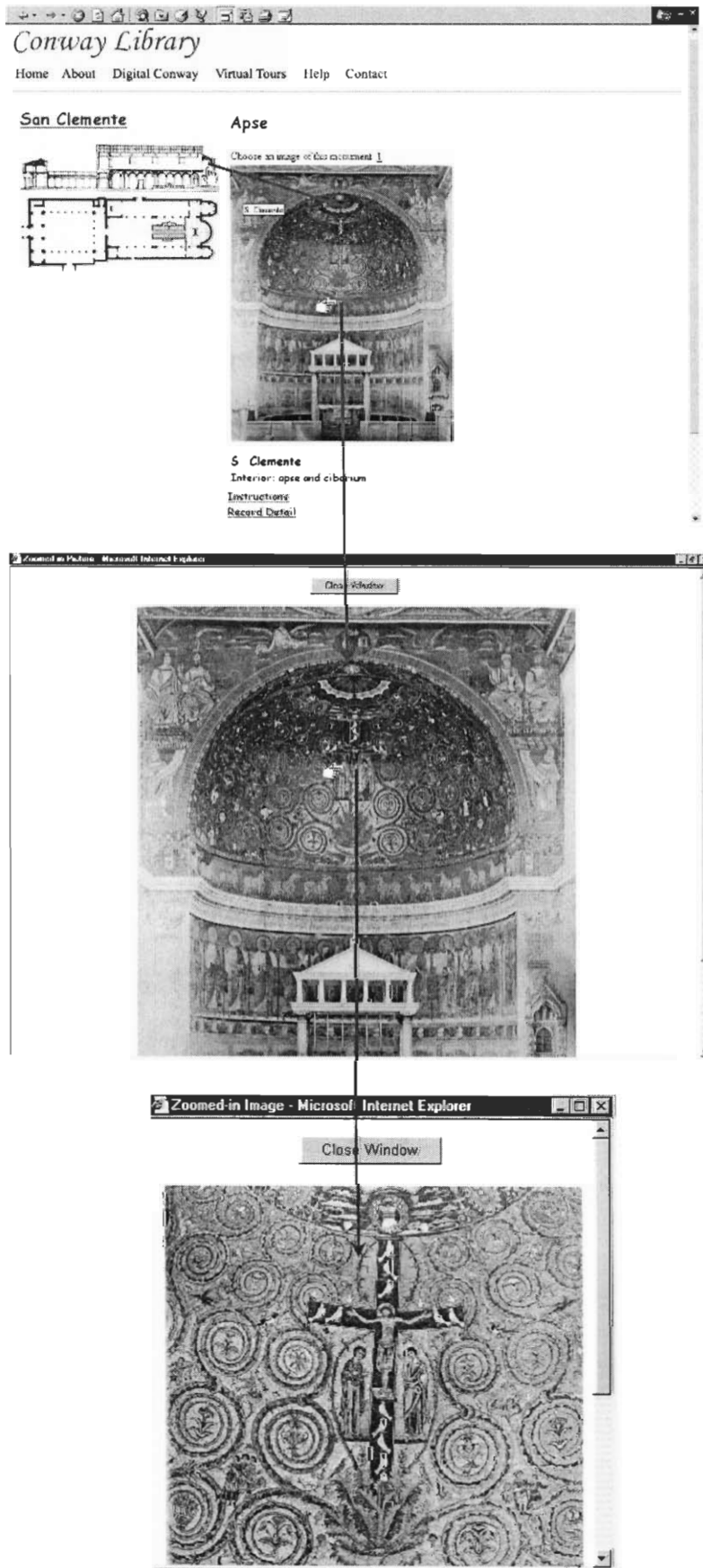
A plan of the church is to the left.



This page has been validated by the World Wide Web Consortium (W3C) as 100% XHTML 1.0 Transitional compliant.

Copyright © 2001, *Conway Institute of Art*  
Contact: The webmanager at [mvstarim@wps.edu](mailto:mvstarim@wps.edu)

Figure 4.9: San Clemente Tour Functionalities



The San Clemente Virtual Tour has the same functionalities as the Forum Virtual Tour. A user can click on objects located inside the plan and section to view digitised images of these objects. The user can also view a larger image of an object by clicking anywhere on the image located on the right side of the plan/section. Certain parts of the larger image can be clicked on to view a zoomed-in image of the particular parts.

### **Virtual Tour Testing**

The purpose of the testing was to find any errors and design flaws in the virtual tour by exposing the web site to various conditions such as different types of Internet browsers and different monitor screen resolutions. When we found flaws and errors during these various types of tests, we went back to the design and development phase to fix the problems.

#### **Various Web Browsers.**

The virtual tour was tested to ensure compatibility with various Internet web browsers: Microsoft Internet Explorer, Netscape Navigator, Opera, and Mozilla. Different types of browsers have different techniques to run the technology that the virtual tour utilized such as image mapping. A web site displayed properly by one type of browser might not run properly in other browsers. After rigorously testing the web site in different browsers, we had created a web site that ran properly in Explorer, Navigator, Opera, and Mozilla.

Figure 4.10: Virtual Tour Running on Explorer

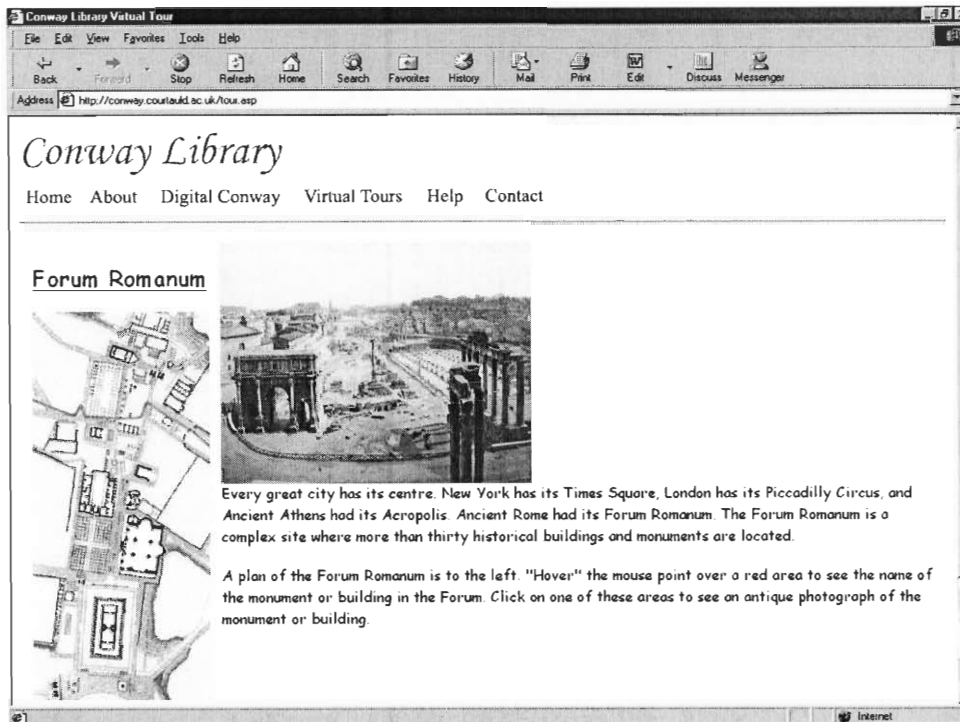


Figure 4.11: Virtual Tour Running on Navigator

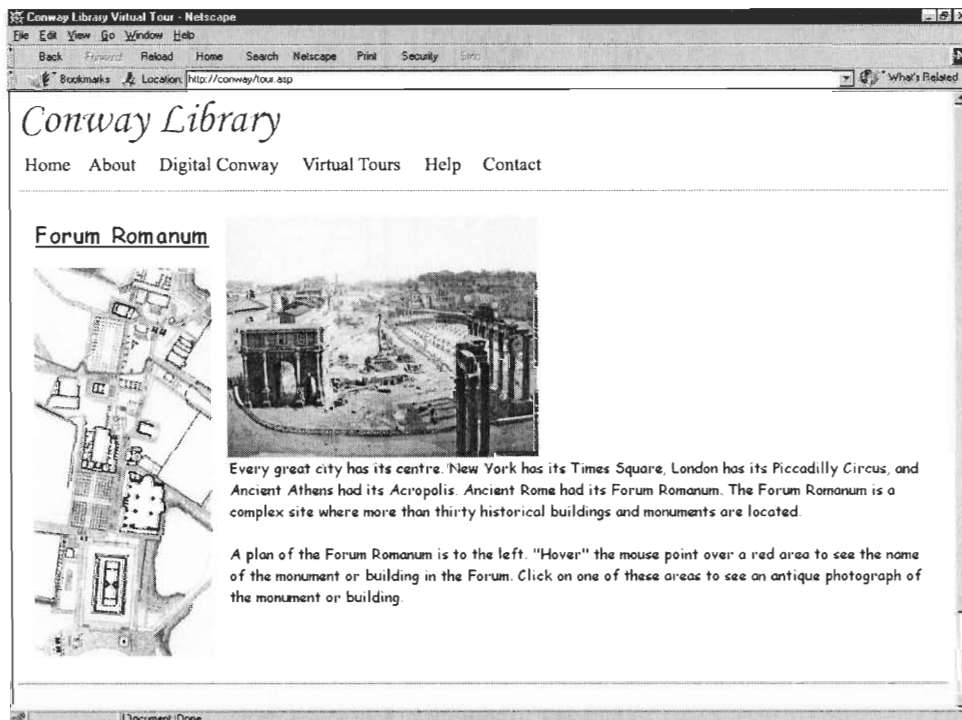


Figure 4.12: Virtual Tour Running on Mozilla

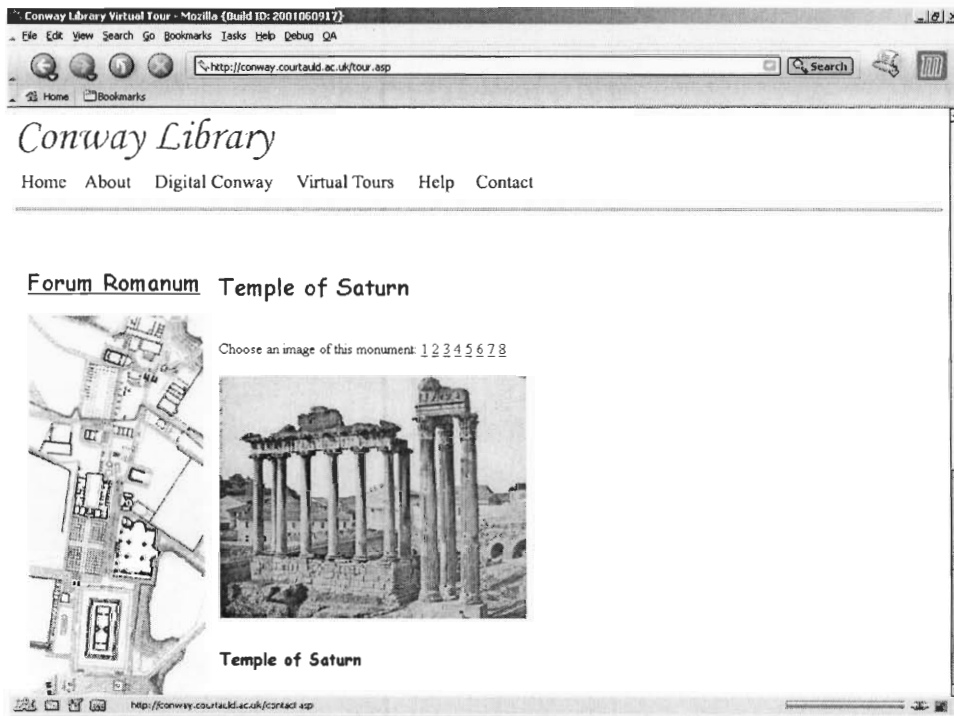
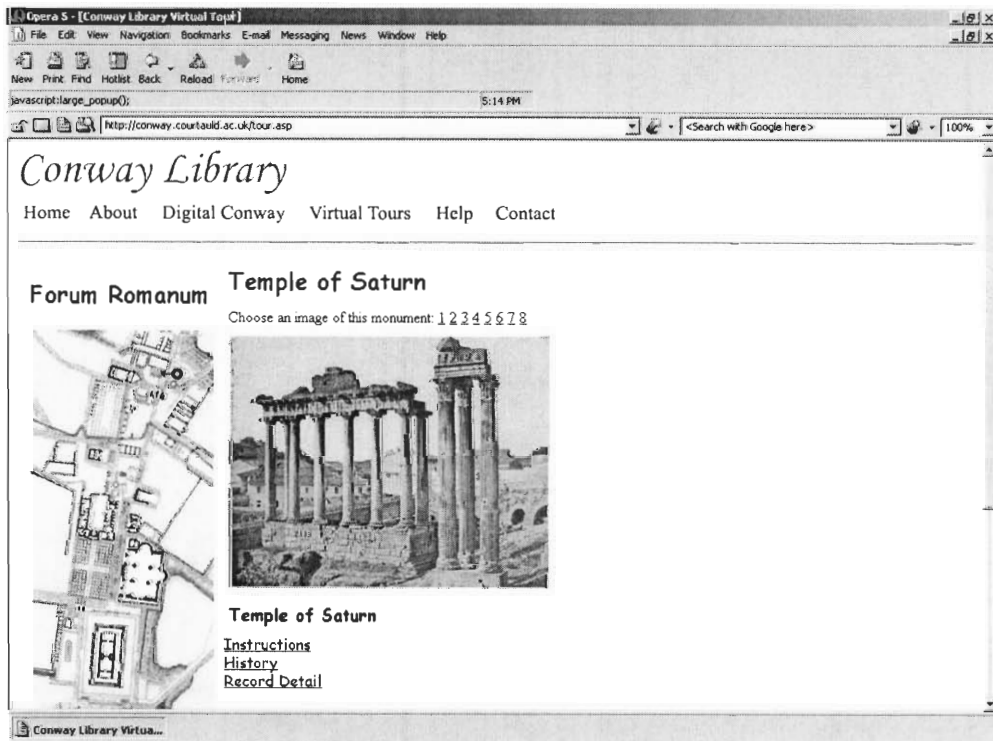


Figure 4.13: Virtual Tour Running on Opera



## Various Screen Resolutions.

Another test that the web site needed to pass was different monitor screen resolutions. Screen resolutions determine the size of a web site displayed on a web browser. The three most commonly used screen resolutions are 640 x 480, 800 x 600 and 1024 x 768. A monitor with lower resolutions, such as 640 x 480 and 800 x 600, display larger text and larger image. Therefore, a web page that fits on a 1024 x 768 screen might look awkward on a screen with a lower resolution. We developed the virtual tour that can be displayed properly on 640 x 480, 800 x 600, and 1024 x 768 screen resolutions.

Figure 4.14: Virtual Tour Displayed on 640 x 480 Resolution

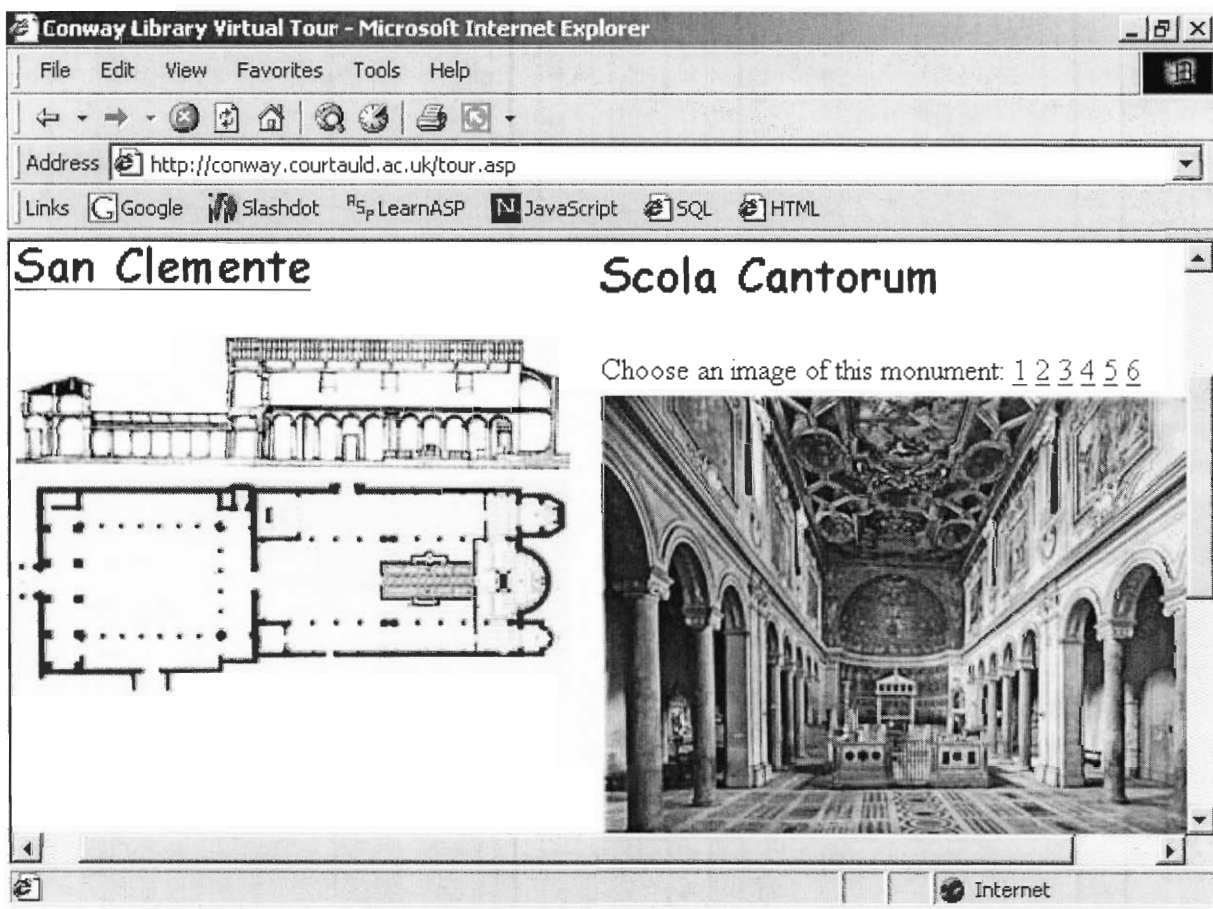


Figure 4.15: Virtual Tour Displayed on 800 x 600 Resolution

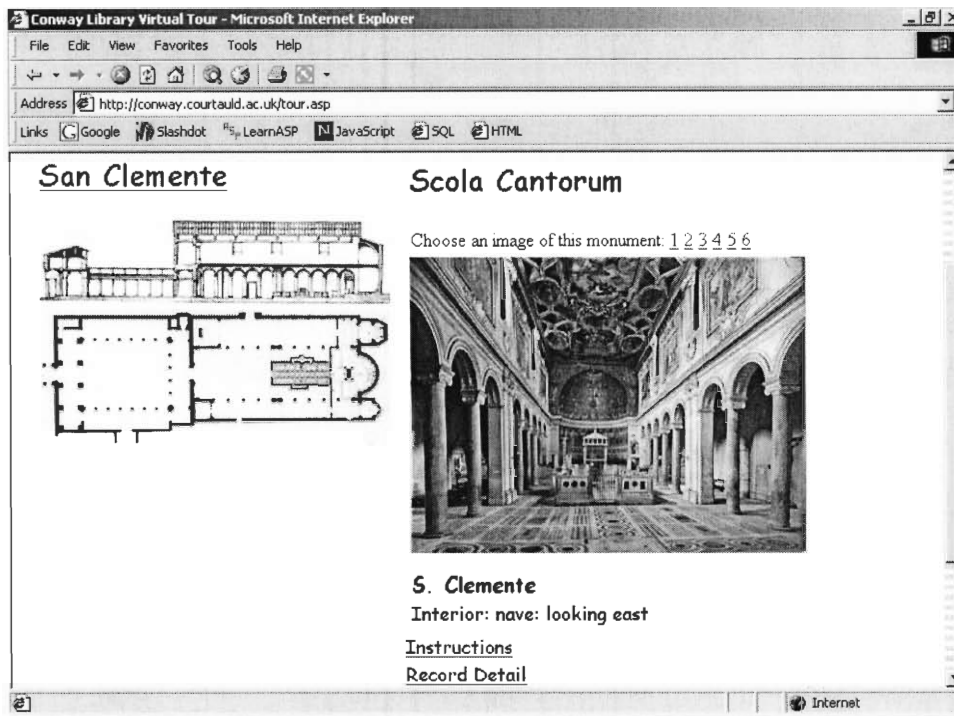
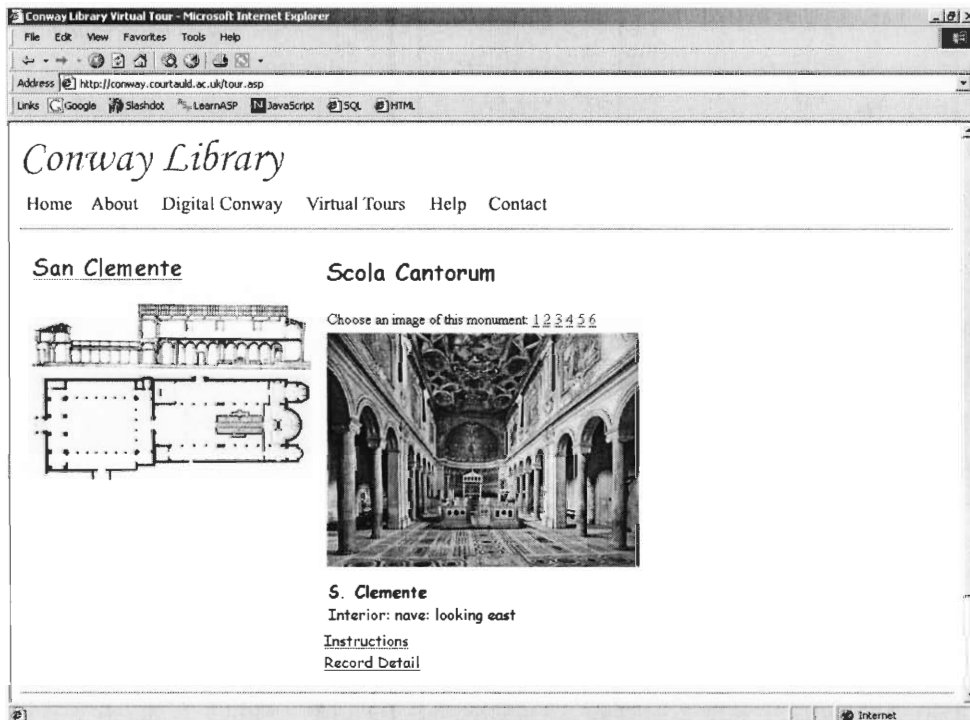


Figure 4.16: Virtual Tour Displayed on 1024 x 768 Resolution

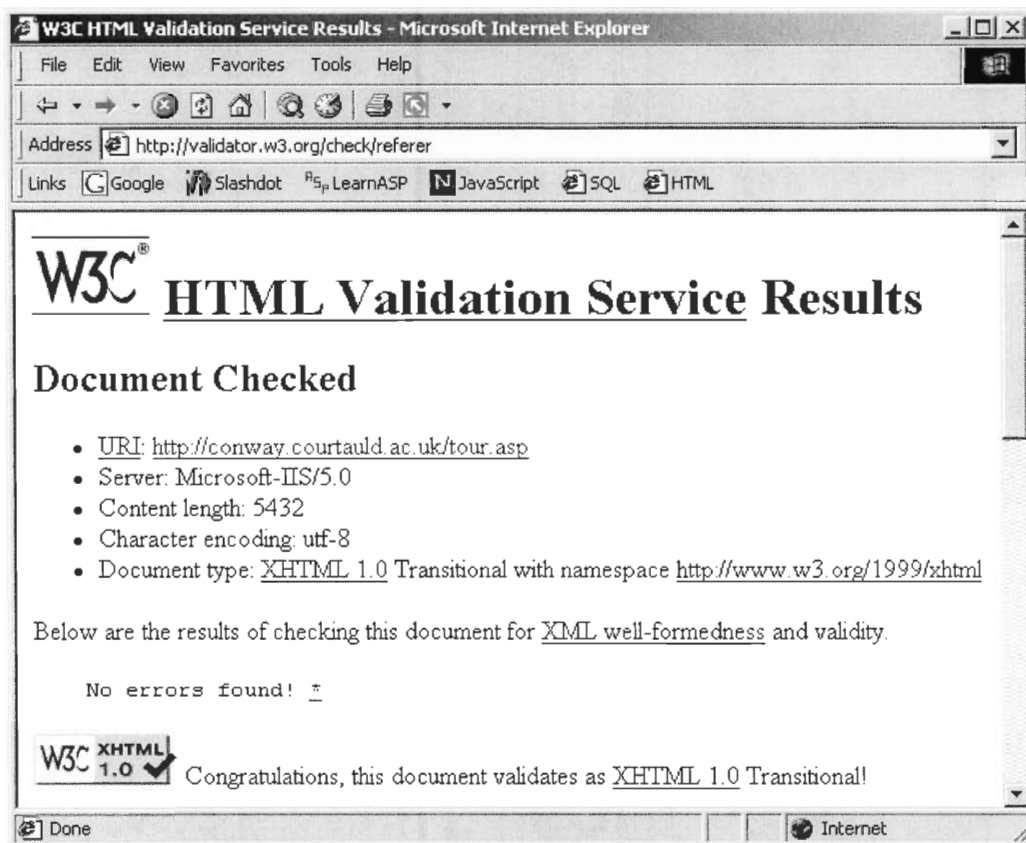




## HTML Standard.

We also tested and ensured that the program coding of our virtual tour web site meets the XHTML 1.0 standard. This is the current recommendation of the World Wide Web Consortium (W3C) for the design of new web pages. By meeting this standard, we ensured the compatibility of our web site with future web browsers.

Figure 4.17: HTML Validation



## Internet Connection Speed.

The time it takes for the virtual tour to load up is an important factor that we need to test. To minimize this load time, we degraded the quality of the images displayed in the virtual tour to an acceptable quality. At 5.6 Kilobits/second (56K) Internet connection, which is the most common speed to access the Internet, the introduction page of the virtual tour loaded up

completely in 26 seconds. Most schools and universities that are connected to the Internet have connection speed rates faster than 56K. For example, the Conway Library is connected to the Internet with a fast broadband connection. The main page of the virtual tour completely loaded up in less than five seconds. By testing the load time of the virtual tour, we ensured that the web site could be accessed in a reasonable time, even with a slow Internet connection.

### **The Final Version of the Virtual Tour**

The final version of the virtual tour can be accessed at

<http://conway.courtauld.ac.uk/tour.asp>.

This final version resembles the prototype in design and functionality. The most noticeable addition to the prototype is the inclusion of blue arrows, located inside plan and section, showing the points of view of the photographs (see Figure 4.18). The blue circle indicates the location where the photograph was taken and the arrow points to the direction of the photographer's camera. This feature, which was recommended by the sponsor, helps a user to imagine where he or she is standing and viewing inside the historical site.

Figure 4.18: Virtual Tour with Point of View Arrow



### 4.3 VIRTUAL TOUR ASSESSMENTS

After our liaison, Dr Lindy Grant, agreed that the last version of our web site had met all of her functionality requirements, we started the assessment on the virtual tour in the forms of survey and ethnographic interview. The objective of this assessments were to obtain the opinions of the web site's potential audience (secondary school students and teachers) on the functionality and the presentation of the virtual tour. Another objective of the assessments was to identify possible improvements and recommendations on the virtual tour that would be helpful for the library's future projects involving similar virtual tours.

#### Adapted WebQual Survey

The questionnaire used in the web site assessment was based on the WebQual survey, a tool to assess the quality of e-commerce web sites. We adapted the WebQual to make it suitable for assessing our virtual tour, which was an educational web site. This modified WebQual questionnaire is included in the Appendix section.

The assessment of the virtual tour examined ten factors of the web site: information quality, visual appeal, users' trust, intuitiveness, innovativeness, design appeal, interaction, emotional appeal, viable substitute, and response time. An explanation for each factor is covered in Chapter 3.

### **Pre-testing Survey**

Before we started using the survey tool to assess the virtual tour, we pre-tested the questionnaire to ensure the wordings and the context of the questionnaire were appropriate. We pre-tested the questionnaire to two different groups, teachers and students, representing two groups of sample that would actually assess the virtual tour. Our liaison, Dr Grant, provided us with four students from St. Catherine School in Kent. We let these students use the virtual tour and then asked them to fill the modified WebQual questionnaire. After the four students completed the survey, we asked their opinions on the questionnaire. The students were aware that similar questions, although with different wording, were asked repeatedly in the survey. We asked these repeated questions on purpose since, according to our literature review on WebQual survey, the repetitions would increase the accuracy of the survey results. The students felt that the wording of the questionnaire was appropriate and easy to understand.

The group representing teachers during the survey pre-testing consisted of two experienced teachers: WPI Professor Chickery Kasouf, our project advisor, and Dr Lindy Grant, our liaison. Based on the discussion during this pre-testing, we revised questions which were identified as double-barrelled questions. For example, one question asked whether the virtual tour is easier to use as a teaching tool than transparencies, slides, or posters. We realized that this question asked the participants to compare the virtual tour with three different types of teaching method. The virtual tour might be easier to use than slides, but the web site might be

more difficult to use than posters. We revised this question to ask if the web site is easier to use than the participant's most preferred teaching method. This revised question eliminated the double-barrelled problem since it would now ask the participant to compare the virtual tour to one teaching method, which the teacher preferred most.

### **Ethnographic Interviews**

The objective of the ethnographic interviews, following the web quality survey, was to get in-depth information which might be missed in the survey and also to identify improvements and recommendations which would be considered in the library's future virtual tour projects. To assess the quality of the web site, we asked the participants questions regarding five dimensions of the virtual tour: information quality, visual appeal, design appeal, intuitiveness, and viable substitute potential. These five dimensions were the most important factors of the web site that we needed to assess using the ethnographic interviews. These five dimensions were also measured in the WebQual survey, and the questions used in the WebQual survey regarding these dimensions served as probes during the interviews with the students and teachers.

### **Assessment Results**

The virtual tour assessments in forms of surveys and ethnographic interviews took place on the July 19<sup>th</sup>, 21<sup>st</sup>, and 22<sup>nd</sup>. Seventeen students and four teachers from three different schools participated in the research. The students from Nautical School and St Catherine School specialized in art and history. The students from Graveney School had not specialized in particular subjects yet. The age range of the students was 14 to 18 year old. The teachers from the three schools taught art and history to secondary school students. The summary of the results are discussed in the following two subsections (Survey Results and Ethnographic

Interview Results), while the complete results such as the results of the questionnaire are shown in the Appendix section.

### **Survey Results.**

The summary of the survey results below was based only on the survey administered to students. The results of the survey administered to teachers were inconclusive due to the extremely small number of teachers participating in the research. It is also important to note that the results of the student survey could not be extrapolated into a larger population of students due to the fact that our sample in this research was not statistically valid. Due to the time constraints after developing the site, the number of students participating in the survey was relatively small and these participants were selected using the convenience sampling. While these results should be interpreted with caution, this assessment represents a first test of the site with potential users.

The modified WebQual survey examined ten dimensions of the virtual tour. Each dimension is measured with a scale of one to seven. A score of one indicates an extremely negative view toward a dimension while seven indicates an extremely positive view toward the dimension. The analysis of survey results for each dimension is shown below.

#### 1. Informational Quality

Average score = 4.25

The information quality dimension received one of the lowest scores in our survey. This low score was understandable since the information contained in the virtual tour during assessment was minimal. Only one building (Temple of Saturn) was described relatively in detail.

#### 2. Design Appeal

Average Score = 5.68

Most students agreed that the design of the web page was supportive in making the virtual tour easy to navigate. They also agreed that the texts displayed in the tour were legible.

### 3. Visual Appeal

Average Score = 4.20

The participants had a mixed view toward the web site's visual (photographs, background image, plan, etc).

### 4. Emotional Appeal

Average Score = 4.31

The students also had a mixed view toward the emotional appeal of the web site. We believed that the score was heavily influenced by the participants' environment during the assessment. The environment during the assessment was not secluded. Participants could converse with others while they were completing the survey. Therefore, their emotions during the assessment were not only influenced by the web site, but also by their fellow participants.

### 5. Intuitiveness

Average Score = 6.14

High intuitiveness was one of the strongest aspects of the virtual tour. Most participants agreed that the web site was easy to use.

### 6. Innovativeness

Average Score = 4.29

The result of the survey indicates that most St Catherine students thought that the web site was innovative. The students from the two other schools had a mixed toward the

innovativeness of the virtual tour which might indicate that these students had more experience in using the Internet and they had seen other web sites with designs similar to the virtual tour's.

#### 7. Interaction

Average Score = 4.41

Students from the St Catherine School and Nautical School mostly agreed that they could interact with the web site to obtain helpful information. Students from Graveney had mixed views toward the web site's interactive features.

#### 8. Trust

Average Score = 6.24

The assessments of the virtual tour were conducted inside the Conway Library which ensured the participants that the virtual tour was sponsored by the library; therefore, they believed that the information contained in the virtual tour could be trusted

#### 9. Response Time

Average Score = 6.67

During the assessments, the virtual tour was run on computers with broadband connection. All of the virtual tour's web pages were displayed in less than five seconds.

#### 10. Viable Substitute

Average Score = 5.58

The students generally agreed that obtaining information in the web site was easier and more interesting than reading textbooks. Although this result indicated the students' willingness to utilize the virtual tour as a learning tool, we believed that the web site was



not a substitute to text books since the virtual tour contained much less information than text books.

### **Ethnographic Interview Results.**

The ethnographic interview served two purposes: to learn about participants' in-depth opinions on the tour and to obtain recommendations for the Conway Library's continuation in the virtual tour development.

The ethnographic interview involved observations on participants' interactions with the virtual tour and a group interview session following the observations. In this interview, we attempted to obtain more in-depth information about participants' opinions toward the visual, the design, the intuitiveness of the virtual tour, and the potential of the web site as a substitute to the participants' (teachers and students) teaching and learning tools.

#### 1. Intuitiveness

We believed that our virtual tour survey was intuitive for people who were familiar with Internet browsing. During their interactions with the virtual tour, we observed that the participants seemed to be able to navigate the web site without much confusion. When the question of intuitiveness was brought up during the group interview, almost all participants agreed that the web site was easy to use. However, one teacher believed that a person with minimal experience in Internet browsing or a user lacking in hand and eye coordination might not find the web site as easy to navigate.

We consulted with Dr Grant to find out her assumption on the expected Internet browsing skill level of potential virtual tour users. According to Dr Grant, the target audience for the virtual tour is users who have an adequate skill to navigate simple web sites such as the virtual tour. Dr Grant also mentioned that users who are capable to use

the Internet browser to access the Conway Virtual Tour web site would also have the adequate skill to navigate the virtual tour.

## 2. Design Appeal

Most participants seemed to find the design of the virtual tour was supportive in making the web site straightforward and simple to use. The red-shaded objects in the plan were helpful in showing which objects were mapped with hyperlinks. Students also found point-of-view arrows extremely useful to show their bearing inside the Roman Forum. The students liked the multiple photographs of an object showing the object from different point of views. Participants also thought that the size and type of font used in the virtual tour were suitable and the texts contained in the tour were legible.

The participants recommended these following features which they thought would improve the design of the virtual tour

- 3D model of each building inside the tour allowing users to walk around the 3D model
- Small index images (thumbnails) of objects that have more than one photograph
- A map of the city showing where the historical site is located
- The ability of zooming into every part of an object
- The ability to display multiple pictures for the purpose of comparing details between the photographs
- Appropriate sound effects such as the sound of gladiatorial battle
- Four compass arrows, located inside the map, showing east, west, north, and south directions
- Latin dictionary which would be useful to translate Latin inscriptions on objects

- A glossary for architectural terms
- Links to external web sites providing users with more detailed information about the objects inside the tour

### 3. Visual Appeal

The participants agreed that the pictures were high quality and performed an admirable task of showing detailed parts of an object. Based on the participants' overwhelming positive views toward the photographs, we believed that presentation of these high quality photographs to be the strongest aspect of the virtual tour. However, some participants disliked the background image of the web site, and they would like to see more exciting images (Roman soldiers, gladiators) in the tour.

### 4. Viable Substitute

Although the students agreed that the virtual tour was far more interesting to use than textbooks, the teachers believed that the virtual tour was more of a complement to the current teaching tool than a substitute. The teachers thought that many instructors would find the virtual tour to be more complicated to use than more traditional visual aids such as posters, videos, and slides. There was also the issue of the Internet accessibility inside secondary school classrooms. Classrooms in schools, like the London Nautical, were usually unequipped with computers with Internet connection. Although computer labs were usually available inside schools, most teachers were unable to hold history or art courses inside these labs. Therefore, the teachers could not rely solely on web sites as visual aids. Access to educational web sites like the virtual tour, however, might be useful as a homework assignment (assuming most students' home had PCs with Internet

connection) or an occasional class activity conducted occasionally at the school's computer lab.

#### 5. Information Quality

Regarding the quality of information contained in the virtual tour, the general agreement among the research participants was they wanted to see more historical descriptions of each object inside the tour. The virtual tour during the assessment only included descriptions of the Temple of Saturn. Although the teachers and students had a positive view toward the grouping of information into subjects (history, architecture, and photography), they wanted to see more facts behind other buildings inside the Forum. The students were most interested to learn about the functions of the buildings during the ancient era. One student also suggested that it would be useful if the tour showed a dimension of the actual size of a building.

### **4.4 WEB DEVELOPMENT TOOL AND MANUAL**

Our virtual tour featuring the Roman Forum and the San Clemente would become a blueprint for Conway's future virtual tours modelling other historical sites. Since the library was lacking in staff members who were technically trained as web builders, we created a tool which could be used by inexperienced web administrators to build new virtual tours, and edit and add new contents to existing ones. This tool was installed in the Conway Library server computer and can be accessed by the library staff members. Discussions on how to use the tool are discussed in detail in the user manual.

Our sponsor had clearly indicated the user manual was an essential part of our project. This manual needed to be as descriptive and as simple as possible since its potential readers were not trained web administrators. To ensure that the manual was simple and easy to understand, Dr

Grant volunteered to test the tool and proofread the manual. We revised parts of the manual where Dr Grant felt confused or unsure about certain procedures. This user manual is included in the Appendix section of this report.

#### **4.5 CONCLUSION**

The final version of the Conway Library virtual tour can be accessed at <http://conway.courtauld.ac.uk/tour.asp>. Before reaching this final form, the tour had gone through designing, development, and testing phases. After the tour technology was completed, we conducted quality assessments on the virtual tour to acquire the opinions of its potential audience. The final part of the project involved the creation of web development tool with user manual that could be utilized by the Conway staff members to create new virtual tours featuring other historical sites.

## Chapter 5: Conclusions and Recommendations

In this last chapter we summarise the objectives we achieved in our project at the Conway Library. We also list our recommendations for the library based on the web site assessment results discussed in Chapter 4 and also based on our own observations during the seven-week project at the library.

### **5.1 ACHIEVEMENTS**

We accomplished all of our objectives that we set at the birth of the Conway Library project. We designed a virtual tour according to our sponsor's requirements, created a virtual tour prototype based on this design, and improved the prototype based on the requirements of teachers and students who were the potential users of the virtual tour. When the virtual tour had reached its final form, we conducted assessment sessions to obtain opinions of students and teachers on the quality of the virtual tour. The overall result of these assessments suggests that teachers and students had a positive view toward the virtual tour. They believed that the image mapping technology when coupled with educational descriptions of the photographs would serve as a powerful teaching and learning tool.

The virtual tour, which so far includes Walk Around the Forum and the tour of the San Clemente, can be accessed by the public at <http://conway.courtauld.ac.uk/tour.asp>.

The last part of our project involved the creation of a virtual tour development tool, allowing a Conway staff member with little experience in web development to add and edit information in existing tours and to create new tours modelling other historical sites. This tool is a significant deliverable since it synthesises our work and allows the virtual tour project to continue after we leave London. We also provided the Library staff with an easy to understand

but detailed user manual that explains the procedure of the virtual tour development. This manual is included in this report's Appendix.

## **5.2 RECOMMENDATIONS**

These are our recommendations for the continuation of the Conway Library digitisation project.

### **Recommendations for the Conway staff**

These recommendations are to be performed by the existing Conway staff members such as Dr Grant and Mr Griendly.

#### **1. Start cataloguing images in the Access database.**

The library's current Access database interface, which is a recreation of the older FileMaker Pro interface, shares the similar look and functionality as its predecessor. Library staff members should be able to use the new interface without going through a learning curve. Therefore, newly digitised images should be catalogued in the Access database. Although the FileMaker Pro interface is functional to deal with the library's current operation, the Access database allows more flexibility in term of the number of concurrent users. The virtual tour development tool is also based on an Access database. To be able to add newly digitised images into a virtual tour, the new images must be catalogued in the Access database.

#### **2. Add new content to the existing virtual tours (Roman Forum and San Clemente).**

The result of the assessment on the Roman Forum and the San Clemente virtual tours shows that information quality is one of the weakest areas of the web site. The students

would like to read more historical information about objects inside the tour and they would to see more zoomed-in images of parts of objects. To increase the interest of schools in using the virtual tour inside classrooms, the Conway Library must utilise the web development tool to increase information quality such as adding more descriptions to images and creating more zoomed-in areas.

### **Recommendations for Professional Projects**

These following recommendations are to be performed as professional projects financed by the New Opportunity Funding.

#### **1. Overhaul the library's Database Management System (DBMS).**

The Access database system that we created is based on the older FileMaker Pro DBMS. This database consisted of three completely flat tables, one for each of the three collections of the Conway Library (historic photography, manuscripts, and architecture). In order to ensure the integrity of the information, reduce redundancies, and increase the performance of the system, we recommend that the Conway Library hire a professional Database Manager to normalise the database (increase the number of tables and create relationships between them) and improve the efficiency of common queries by creating indexes within the system. It would perhaps be beneficial to convert the database yet again to a more sophisticated DBMS, such as Microsoft SQL Server or Berkeley's free PostgreSQL server. A cost analysis would be beneficial before any changes are made to the current system.

#### **2. Tailor the virtual tour for different types of audience.**

The virtual tour audience might consist of people with various age ranges; therefore, the virtual tour should be tailored to meet the audience's different comprehension levels. For



example, there should be a version of the virtual tour aimed for children under 10-year old. This virtual tour should be more colourful, include cheery images and sounds that would interest these children. The texts in this version of the tour should also be written specifically to accommodate the limited vocabulary of the children.

### **Recommendations for Future WPI Projects**

These recommendations are intended for future WPI projects.

#### **1. Add new features to the virtual tour.**

The participants of the virtual tour assessments recommended useful features for the virtual tour. Although all of the recommendations are sensible, not all of them have the feasibility to be applied into the web site. The following features are new features that we believed to be applicable to the virtual tour:

- Compass arrows showing north, south, east, and west directions
- Thumbnails to preview large number of photographs
- Multiple photographs comparison
- A map of the city where the virtual tour site is located
- A glossary for technical terms

#### **2. Conduct a proper assessment research on the virtual tour.**

Due to the limited number of samples in our past assessment on the virtual tour, the result of the research cannot be extrapolated to a larger population. The convenient sampling method used in the research also causes the sample to be statistically invalid. The opinions of the students and teachers participating in the research do not represent the opinions of all

students and teachers in London. Before the virtual tour is used widely as an educational tool, the Library should conduct a statistically valid research.

We recommend the Library to administer a web-based survey to participants who are selected through a stratified sampling method. A stratified sampling method is the most suitable for a population with various sub-groups such as students with different educational background, or teachers with different levels of computer knowledge. The opinions on an issue inside each sub-group are less varied than the overall population. In a research with stratified sampling method, each sub-group is studied independently to obtain the opinion of each sub-group.

The audience of the virtual tour will consist of students with different educational background. Students with art and history background might have a totally different opinion on the web site than students without the similar background. Teachers who were uncomfortable with computers and the Internet might have a different view toward the virtual tour than teachers who have used computers intensively. A proper assessment on the virtual tour should be conducted in each group with similar educational background, such as secondary school students who specialise in art history.

### **5.3 SUMMARY**

Our project involves the creation of an educational web site with virtual tours of the Roman Forum and the San Clemente church. The purpose of this educational web site is to allow users without technical background in art and architecture to view the library's collection of 19<sup>th</sup> century photographs of Rome, accompanied with historical, architectural, and photographical information. This project also provides the Conway Library staff with a virtual

tour development tool and a user manual that allow the staff members to create new tours based on other historical sites.

After the Roman Forum and the San Clemente tours were completed, we assessed the quality of these products by conducting surveys and interviews with potential users. The results of the assessment indicate that the virtual tour is intuitive and has the potential to be a useful teaching and learning tool inside classrooms.

Based on our observations and assessment results, we presented our recommendations for the continuation of the library's digitisation project. These recommendations are expected to increase the effectiveness of the virtual tour as an educational tool.

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## Appendix A: Glossary

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*Altar.* An elevated place or structure before which religious ceremonies may be enacted or upon which sacrifices may be offered. A structure, typically a table, where the divine offices are recited and upon which the Eucharist is celebrated in Christian churches. (Lexico LLC, 2001)

*Apse.* A semicircular or polygonal, usually domed projection of a building, especially the altar or east end of a church (Lexico LLC, 2001).

*Arch.* A structure, especially one of masonry, forming the curved, pointed, or flat upper edge of an open space and supporting the weight above it, as in a bridge or doorway. Or a structure, such as a freestanding monument, shaped like an inverted U. (Lexico LLC, 2001)

*Atrium.* A rectangular court, usually sky lighted central area, often containing plants, in some modern buildings, especially of a public or commercial nature. The open area in the centre of an ancient Roman house. Or the forecourt of a building, such as an early Christian church, enclosed on three or four sides with porticoes. Or a bodily cavity or chamber, especially either of the upper chambers of the heart that receives blood from the veins and forces it into a ventricle. In this sense, also called auricle. (Lexico LLC, 2001)

*Basilica.* A public building of ancient Rome having a central nave with an apse at one or both ends and two side aisles formed by rows of columns, which was used as a courtroom or assembly hall. A Christian church building of a similar design, having a nave with a semicircular apse, two or four side aisles, a narthex, and a

clerestory. Or a church that has been accorded certain privileges by the pope.  
(Lexico LLC, 2001)

*Cathedral church.* The church in which the Bishop should have his cathedra, his seat, or throne  
(Bumpus, 1898).

*Chapel.* A place of worship that is smaller than and subordinate to a church. Or a place of  
worship in an institution, such as a prison, college, or hospital. A recess or room  
in a church set apart for special or small services. A place of worship for those not  
belonging to an established church. (Lexico LLC, 2001)

*Choir.* The space reserved for the clergy in a church. Usually it lies east of the transept, but in  
some instances extends into the nave (Gardner, 1959).

*Cloister.* A covered walk with an open colonnade on one side, running along the walls of  
buildings that face a quadrangle. Or a place, especially a monastery or convent,  
devoted to religious seclusion. (Lexico LLC, 2001)

*Column.* A supporting pillar consisting of a base, a cylindrical shaft, and a capital (Lexico LLC,  
2001).

*Curia.* Latin for house (The Perseus Digital Library, 2001).

*Elevation.* A scale drawing of the side, front, or rear of a structure (Lexico LLC, 2001).

*Façade.* The face of a building, especially the principal face (Lexico LLC, 2001).

*Forum.* The public square or marketplace of an ancient Roman city that was the assembly place  
for judicial activity and public business (Lexico LLC, 2001).

*Insula.* City dwellers of the imperial period that could not afford private residences lived in  
*insulae*, multi-storey brick and concrete structures strikingly similar to modern



apartment houses. The best-preserved examples are at Ostia, the port of Rome at the mouth of the Tiber River, and date from the 2d and 3d centuries. (Fox, 1997).

*Lacus.* Latin for pool or fountain (The Perseus Digital Library, 2001).

*Loggia.* An open-sided, roofed gallery or arcade along the front or side of a building, often at an upper level. Or an open balcony in a theatre. (Lexico LLC, 2001)

*Narthex.* A portico or lobby of an early Christian or Byzantine church or basilica, originally separated from the nave by a railing or screen. Or an entrance hall leading to the nave of a church. (Lexico LLC, 2001)

*Nave.* The central part of a church, extending from the narthex to the chancel and flanked by aisles (Lexico LLC, 2001).

*Oratory.* A place for prayer, such as a small private chapel (Lexico LLC, 2001).

*Pier.* A platform extending from a shore over water and supported by piles or pillars, used to secure, protect, and provide access to ships or boats. Or any of various vertical-supporting structures, especially: A pillar, rectangular in cross section, supporting an arch or roof. Or the portion of a wall between windows. Or a reinforcing structure that projects from a wall; a buttress. (Lexico LLC, 2001)

*Pilaster.* A rectangular column with a capital and base, set into a wall as an ornamental motif (Lexico LLC, 2001).

*Plan.* Top or horizontal view of an object. A large-scale map of a small area. (Merriam-Webster Online, 2001)

*Portico.* A porch or walkway with a roof supported by columns, often leading to the entrance of a building (Lexico LLC, 2001).

*Propylon.* The porch, vestibule, or entrance of an edifice (Lexico LLC, 2001).

*Rostra.* A podium used in public speaking ([The Perseus Digital Library](#), 2001).

*Section.* The profile of something as it would appear if cut through by an intersecting plane ([Merriam-Webster Online](#), 2001).

*Tabernae.* Latin for shops ([The Perseus Digital Library](#), 2001).

*Tabernacle.* A case or box on a church altar containing the consecrated host and wine of the Eucharist ([Lexico LLC](#), 2001).

*Transept.* The part of a cruciform church that crosses at right angles to the greatest length between the nave and the apse or choir. ([Merriam-Webster Online](#), 2001)

*Tufa.* The calcareous and siliceous rock deposits of springs, lakes, or ground water ([Lexico LLC](#), 2001).

*Vault.* An arched structure, usually of stone, brick, or concrete, forming the supporting structure of a ceiling or roof. Or an arched overhead covering, such as the sky that resembles the architectural structure in form. Or a burial chamber, especially when underground ([Lexico LLC](#), 2001).

# Appendix B: Survey Questionnaire

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## B.1 QUESTIONNAIRE FOR STUDENTS

Based on your review of the virtual tour, please circle the number that best describes how well each of the following attributes describes the Web site.

Please circle the appropriate number for each question and respond to ALL statements.

	Strongly disagree	Strongly agree
1. The Web site design is innovative.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
2. The web site is a more interesting learning tool than text books.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
3. I find the Web site easy to use.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
4. I can interact with the Web site in order to get information tailored to my specific needs.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
5. The information on the Web site is pretty much what I need to carry out my learning.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
6. The web site texts are easy to understand.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
7. The web site loads quickly.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
8. The web site is visually appealing.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
9. It would be easy for me to become skilful at using the web site.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
10. The web site adequately meets my information needs.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
11. I feel cheerful when I use the Web site.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
12. I am more interested using this Web site to study than reading text books.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
13. Learning to operate the Web site is easy for me.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	

	Strongly disagree	Strongly agree
14. The Web site has interactive features, which help my learning.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
15. The Web site is innovative.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
16. I trust the Web site creators will not put inaccurate information on the Web site.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
17. The Web site allows me to interact with it to receive tailored information.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
18. The Web site displays visually appealing design.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
19. When I use the Web site there is very little waiting time between my actions and the Web site's response.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
20. The Web site is visually pleasing.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
21. The display pages within the Web site are easy to read.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
22. I trust the Web site to only display correct information.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
23. The information on the Web site is effective.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
24. The Web site is an alternative learning tool to reading text books.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
25. I feel the information on the Web site is accurate.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
26. The web site is creative.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
27. I feel sociable when I use the Web site.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
28. The text on the Web site is easy to read.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
29. I feel happy when I use the Web site	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
30. The Web site takes a long time to load	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	

## B.2 QUESTIONNAIRE FOR TEACHERS

Based on your review of the virtual tour, please circle the number that best describes how well each of the following attributes describes the Web site.

Please circle the appropriate number for each question and respond to ALL statements.

	Strongly disagree	Strongly agree
1. The Web site design is innovative.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
2. The Web site is more effective as a teaching tool than my favourite visual aid.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
3. I find the Web site easy to use.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
4. I can interact with the Web site in order to get information tailored to my specific needs.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
5. The information on the Web site is pretty much what I need to carry out my teaching.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
6. The web site texts are easy to understand.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
7. The web site loads quickly.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
8. The web site is visually appealing.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
9. It would be easy for me to become skilful at using the web site.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
10. The web site adequately meets my information needs.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
11. I feel cheerful when I use the Web site.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
12. It is easier to use the Web site to teach my course than it is to utilize my most preferred teaching tool.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
13. Learning to operate the Web site is easy for me.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	

	Strongly disagree	Strongly agree
14. The Web site has interactive features, which help my teaching.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
15. The Web site is innovative.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
16. I trust the Web site creators will not put inaccurate information on the Web site.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
17. The Web site allows me to interact with it to receive tailored information.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
18. The Web site displays visually appealing design.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
19. When I use the Web site there is very little waiting time between my actions and the Web site's response.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
20. The Web site is visually pleasing.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
21. The display pages within the Web site are easy to read.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
22. I trust the Web site to only display correct information.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
23. The information on the Web site is effective.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
24. The Web site is an alternative to the visual aid I most often use in my classroom.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
25. I feel the information on the Web site is accurate.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
26. The web site is creative.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
27. I feel sociable when I use the Web site.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
28. The text on the Web site is easy to read.	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
29. I feel happy when I use the Web site	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	
30. The Web site takes a long time to load	1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7	

# Appendix C: Survey Results

## C.1 STUDENT SURVEY

Table C.1: Student Survey Result - Innovativeness

**Innovativeness (Questions 1, 15, 26)**

St Catherine n=12	Graveney n=24	Nautical n=13	
6	4	6	
6	4	6	
5	4	6	
6	4	5	
6	4	4	
5	2	5	
6	3	N/A	
6	3	N/A	
5	4	6	
6	2	5	
6	2	5	
6	5	6	
	3	4	
	3	4	
	3	3	
	3		
	3		
	4		
	5		
	5		
	2		
	4		
	5		
	6		
Total	69	87	54
Average	5.75	3.63	4.15

Table C.2: Student Survey Result - Intuitiveness

**Intuitiveness (Questions 3, 9, 13)**

St Catherine n=12	Graveney n=24	Nautical n=15	
7	6	3	
7	7	5	
6	7	5	
7	7	6	
7	6	5	
7	6	6	
7	6	7	
6	7	7	
7	6	6	
7	7	7	
7	7	7	
7	7	7	
	3	7	
	5	7	
	5	6	
	5		
	6		
	6		
	5		
	7		
	5		
	6		
	4		
	4		
Total	82	140	91
Average	6.83	5.83	6.07

### ANALYSIS

**Innovativeness (Questions 1, 15, 26)**

Grand Total = 210  
 n = 49  
 Average = 4.29

**Intuitiveness (Questions 3, 9, 13)**

Grand Total = 313  
 n = 51  
 Average = 6.14

Table C.3: Student Survey Result –  
Viable Substitute

**Viable Substitute (Questions 2, 12, 24)**

St Catherine n=12	Graveney n=23	Nautical n=15	
7	4	6	
7	4	5	
6	4	7	
7	5	6	
7	5	6	
7	6	7	
6	6	2	
6	6	2	
7	N/A	5	
7	7	6	
5	5	7	
7	7	6	
	4	7	
	5	6	
	7	6	
	3		
	3		
	7		
	2		
	4		
	6		
	5		
	6		
	5		
Total	79	116	84
Average	6.58	5.04	5.60

Table C.4: Student Survey Result -  
Interaction

**Interaction (4, 14, 17)**

St Catherine N=12	Graveney n=24	Nautical n=15	
6	3	6	
6	2	6	
6	3	5	
7	4	6	
5	2	6	
7	2	5	
6	3	6	
6	3	4	
7	4	4	
5	4	7	
6	3	5	
6	4	5	
	4	3	
	5	4	
	5	4	
	4		
	4		
	4		
	3		
	4		
	3		
	4		
	5		
	5		
Total	73	87	65
Average	6.08	3.63	4.33

**ANALYSIS**

**Viable Substitute (Questions 2, 12, 24)**

Grand Total = 279  
 n = 50  
 Average = 5.58

**Interaction (4, 14, 17)**

Grand Total = 225  
 n = 51  
 Average = 4.41



Table C.5: Student Survey Result - Information Quality

**Information Quality (Questions 5, 10, 23)**

	St Catherine n=12	Graveney n=24	Nautical n=15
	6	7	5
	7	6	4
	7	5	6
	7	2	6
	7	2	5
	6	3	6
	4	3	3
	5	3	3
	5	3	6
	5	4	5
	6	3	5
	6	2	6
		4	6
		3	5
		4	6
		4	
		3	
		3	
		2	
		4	
		5	
		4	
		2	
		5	
Total	71	86	60
Average	5.92	3.58	4.00

Table C.6: Student Survey Result - Design Appeal

**Design Appeal (Questions 6, 21, 28)**

	St Catherine n=12	Graveney n=24	Nautical n=14
	7	6	N/A
	6	1	7
	7	3	7
	7	6	6
	7	6	5
	7	6	6
	7	6	7
	7	5	7
	7	4	6
	7	5	7
	7	5	7
	7	5	7
		7	7
		7	6
		6	7
		6	
		6	
		6	
		6	
		6	
		6	
		6	
		6	
		6	
		6	
		5	
		4	
Total	83	129	72
Average	6.92	5.38	5.14

**ANALYSIS**

**Information Quality (Questions 5, 10, 23)**

Grand Total = 217  
 n = 51  
 Average = 4.25

**Design Appeal (Questions 6, 21, 28)**

Grand Total = 284  
 n = 50  
 Average = 5.68

Table C.7: Student Survey Result -  
Response Time

Response Time (Questions 7, 19, 30)

St Catherine n=12	Graveney n=24	Nautical n=15	
7	7	7	
6	7	7	
7	7	7	
7	7	7	
7	6	7	
7	7	7	
7	6	6	
7	7	5	
7	7	7	
7	7	7	
7	7	6	
7	7	7	
	6	7	
	5	7	
	6	7	
	7		
	6		
	2		
	7		
	7		
	7		
	7		
	7		
	7		
	7		
Total	83	156	101
Average	6.92	6.50	6.73

Table C.8: Student Survey Result -  
Visual Appeal

Visual Appeal (Questions 8, 18, 20)

St Catherine n=12	Graveney n=24	Nautical n=15	
3	3	5	
3	4	5	
3	4	6	
5	4	6	
5	4	5	
4	4	5	
5	2	7	
5	2	6	
5	2	5	
6	4	6	
6	4	6	
6	4	6	
	3	4	
	4	3	
	4	4	
	4		
	3		
	3		
	3		
	3		
	3		
	3		
	3		
	2		
Total	56	79	79
Average	4.67	3.29	5.27

**ANALYSIS**

**Response Time (Questions 7, 19, 30)**

Grand Total = 340  
 n = 51  
 Average = 6.67

**Visual Appeal (Questions 8, 18, 20)**

Grand Total = 214  
 n = 51  
 Average = 4.20

Table C.9: Student Survey Result - Emotional Appeal

**Emotional Appeal (Questions 11, 27, 29)**

	St Catherine n=12	Graveney n=24	Nautical n=15
7		3	4
6		1	4
7		2	3
7		3	6
5		3	6
6		4	6
6		3	3
5		2	4
6		3	4
6		4	6
5		4	5
7		4	6
		3	6
		4	6
		4	6
		4	
		1	
		4	
		3	
		1	
		3	
		4	
		1	
		4	
Total	73	72	75
Average	6.08	3.00	5.00

Table C.10: Student Survey Result - Trust

**Trust (Questions 16, 22, 25)**

	St Catherine n=12	Graveney n=24	Nautical n=15
6		6	7
6		6	7
7		6	7
7		7	5
7		7	5
7		7	5
7		7	6
7		4	6
7		6	6
7		4	7
7		4	7
7		4	7
		6	7
		6	7
		6	7
		6	
		6	
		6	
		6	
		6	
		6	
		7	
		6	
		5	
Total	82	140	96
Average	6.83	5.83	6.40

**ANALYSIS**

**Emotional Appeal (Questions 11, 27, 29)**

Grand Total = 220  
 n = 51  
 Average = 4.31

**Trust (Questions 16, 22, 25)**

Grand Total = 318  
 n = 51  
 Average = 6.24

## C.2 TEACHER SURVEY

Table C.11: Teacher Survey Result –  
Innovativeness

**Innovativeness (Questions 1, 15, 26)**

	Nautical n=6	Graveney n=6
	4	2
	4	5
	5	4
	3	3
	3	3
	4	3
Total	23	20

Table C.12: Teacher Survey Result -  
Intuitiveness

**Intuitiveness (Questions 3, 9, 13)**

	Nautical N=6	Graveney n=6
	4	7
	6	6
	6	7
	7	7
	7	7
	6	7
Total	36	41

### ANALYSIS

**Innovativeness (Questions 1, 15, 26)**

Grand Total =	43
n =	12
Average =	3.58

**Intuitiveness (Questions 3, 9, 13)**

Grand Total =	77
n =	12
Average =	6.42

Table C.13: Teacher Survey Result -  
Viable Substitute

**Viable Substitute (Questions 2, 12, 24)**

	Nautical n=5	Graveney n=6
	2	3
	N/A	3
	5	4
	4	3
	4	4
	4	3
Total	19	20

Table C.14: Teacher Survey Result -  
Interaction

**Interaction (Questions 4, 14, 17)**

	Nautical n=6	Graveney n=6
	2	4
	2	5
	3	2
	4	6
	4	2
	6	5
Total	21	24

### ANALYSIS

**Viable Substitute (Questions 2, 12, 24)**

Grand Total =	39
n =	11
Average =	3.55

**Interaction (4, 14, 17)**

Grand Total =	45
n =	12
Average =	3.75

Table C.15: Teacher Survey Result - Information Quality

**Information Quality (Questions 5, 10, 23)**

	Nautical n=4	Graveney n=6
	N/A	4
	N/A	N/A
	5	6
	4	3
	4	4
	6	6
Total	19	23

Total

Table C.16: Teacher Survey Result - Design Appeal

**Design Appeal (Questions 6, 21, 28)**

	Nautical n=6	Graveney n=6
	6	5
	5	7
	5	7
	7	7
	7	7
	7	6
Total	37	39

Total

**ANALYSIS**

**Information Quality (Questions 5, 10, 23)**

Grand Total = 42  
 n = 9  
 Average = 4.67

**Design Appeal (Questions 6, 21, 28)**

Grand Total = 76  
 n = 12  
 Average = 6.33

Table C.17: Teacher Survey Result - Response Time

**Response Time (Questions 7, 19, 30)**

	Nautical n=4	Graveney n=6
	N/A	7
	6	6
	N/A	7
	7	7
	7	7
	7	7
Total	27	41

Total

Table C.18: Teacher Survey Result - Visual Appeal

**Visual Appeal (Questions 8, 18, 20)**

	Nautical n=6	Graveney n=6
	4	6
	4	6
	4	5
	4	6
	4	4
	5	4
Total	25	31

Total

**ANALYSIS**

**Response Time (Questions 7, 19, 30)**

Grand Total = 68  
 n = 10  
 Average = 6.80

**Visual Appeal (Questions 8, 18, 20)**

Grand Total = 56  
 n = 12  
 Average = 4.67

Table C.19: Teacher Survey Result - Emotional Appeal

**Emotional Appeal (Questions 11, 27, 29)**

	Nautical n=6	Graveney n=6
	4	6
	4	3
	4	5
	5	4
	4	3
	7	4
Total	28	25

Table C.20: Teacher Survey Result - Trust

**Trust (Questions 16, 22, 25)**

	Nautical n=6	Graveney n=6
	7	3
	7	3
	7	3
	7	7
	7	7
	7	7
Total	42	30

**ANALYSIS**

**Emotional Appeal (Questions 11, 27, 29)**

Grand Total = 53  
 n = 12  
 Average = 4.42

**Trust (Questions 16, 22, 25)**

Grand Total = 72  
 n = 12  
 Average = 6.00

## Appendix D: User Manual

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### Conway Library Virtual Tour Development User Manual

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## ***Introduction***

The virtual tour is a part of the Conway Library web site that exhibits digitised images and image descriptions in an interactive manner. The digitised pictures and descriptions are stored in a server database and the virtual tour program automatically extracts appropriate information from the database. To create new virtual tours or to upkeep an existing tour a web administrator needs to update this database. The objective of this manual is to explain the procedure of creating and updating information in the database to Conway staff members with minimal knowledge about the computer system.

The WPI project group provided the Conway staff with tools to create and add information in the Microsoft Access database management software. These tools were created to edit information inside the database, but they do not alter the source code of the virtual tour. Once the information in the database is modified using these tools, the information on the web site will be changed automatically according to the changes made with the tools. Therefore, to make changes to the virtual tour, Conway staff members will only need to use the simplified tools in Microsoft Access without having to make any changes to the complex web site source code.

The procedure of creating a virtual tour consists of five main procedures:

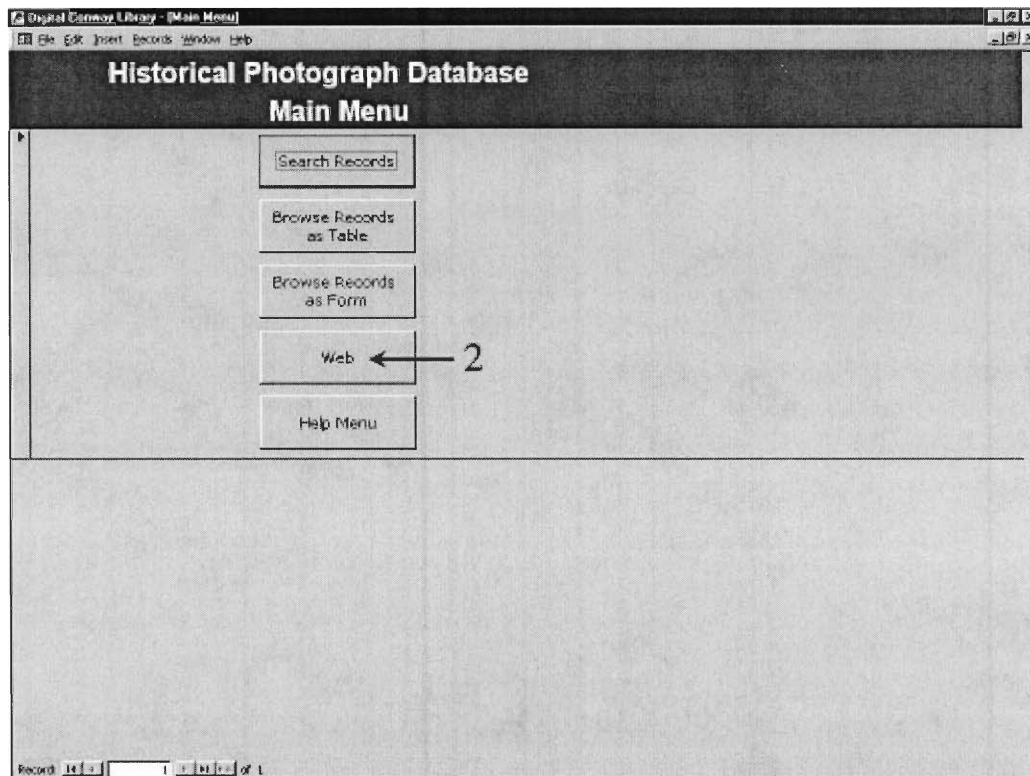
1. Choosing plan and section images for the virtual tour site
2. Assigning coordinates to objects inside the plan and section
3. Allocating pictures to assigned objects and setting point-of-view arrows
4. Adding Zoom-In areas inside images
5. Writing descriptions for each picture
6. Publishing the database contents to the web site

## Creating a Virtual Tour

### Step I: Accessing the Web Menu

1. Turn on the server and double click on the 'conway.mdb' database file. <Figure 1> will show up on the monitor screen.

Figure 1: Main Menu



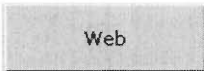
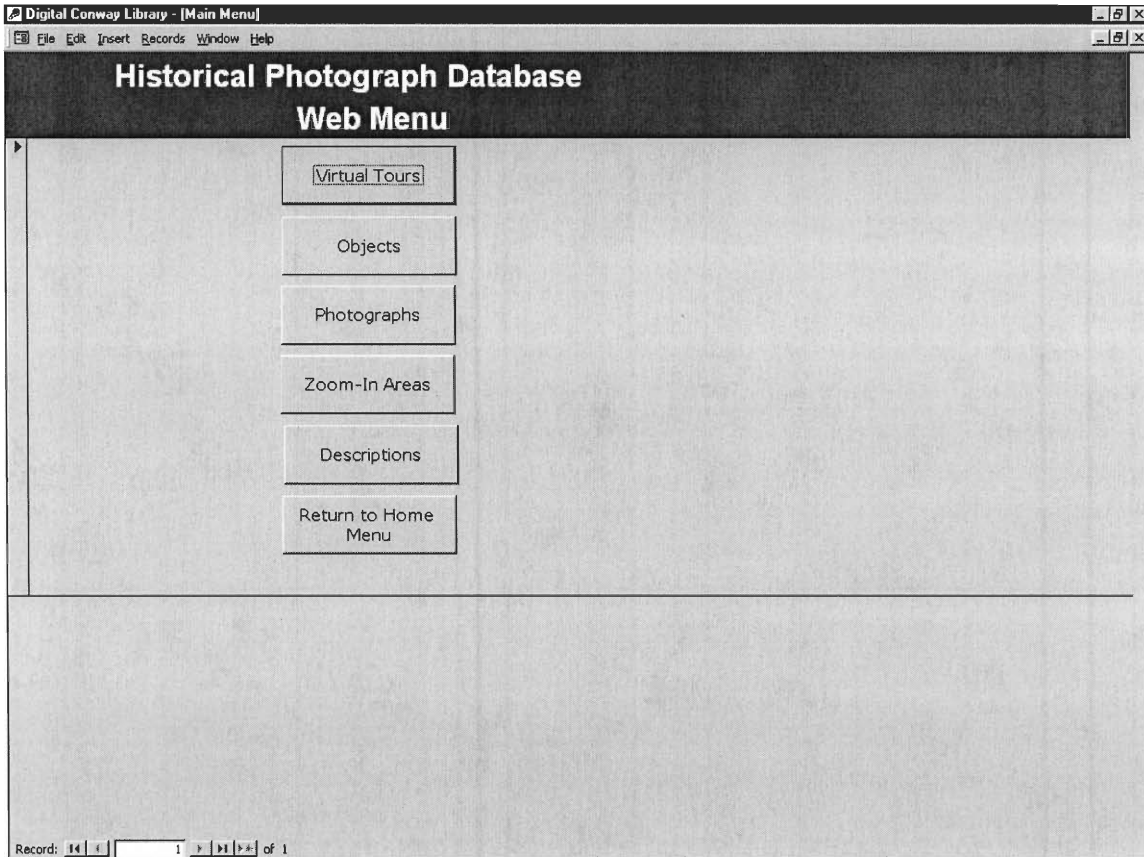
2. Click on the Web button  to access the Web Menu. <Figure 2> will show up.

Figure 2: Web Menu



## Step II: Creating an Introduction Page

A virtual tour consists of a plan image, a section image, photo images, coordinates, arrow positions, arrow directions, and descriptions. In the first step of developing a tour, the title of the tour and a description of the site are necessary. In addition, whether the tour has a section image or not is clarified. <Figure 3> is a screen shot of Manage Virtual Tours form. The Tour Name field refers to the title of the virtual tour, the Site Description field is for the description, and the General View Barcode field refers to the barcode of an image that will be displayed in the introduction page of the tour. The Has Section check box should only be checked if the tour has a section image file as well as plan image file. (Plan Images are always assumed to exist.)

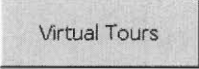
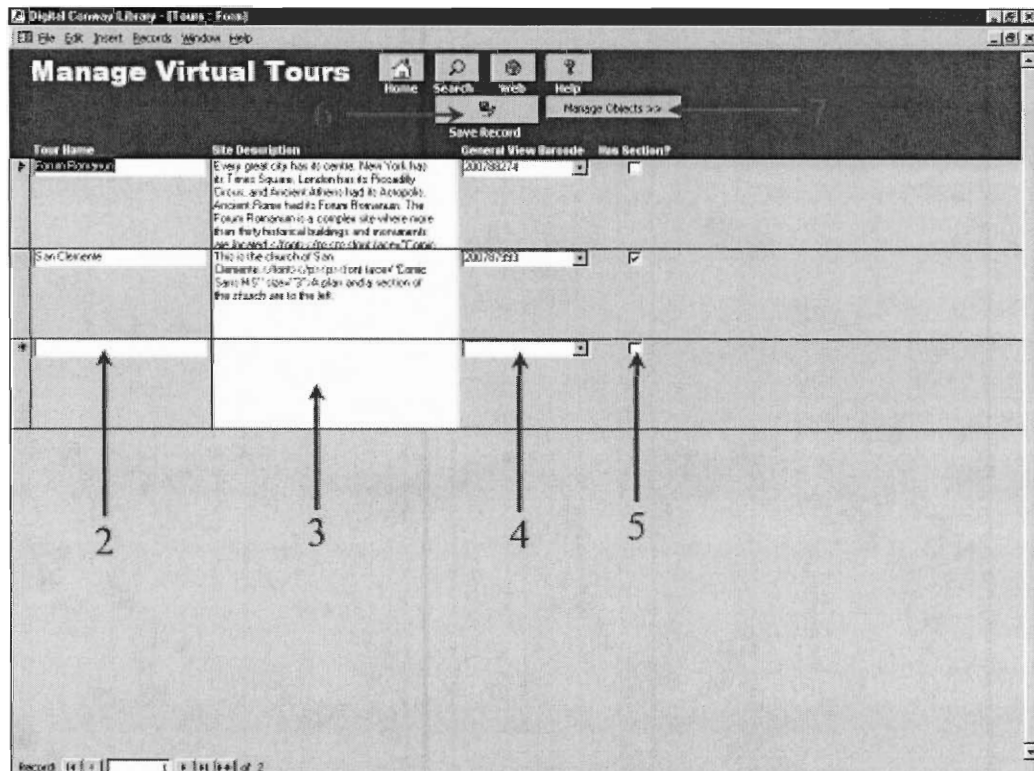


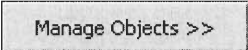

1. Click on the Virtual Tours button  to access the Manage Virtual Tours form if you are in the Web Menu. <Figure 3> will show up on the screen with one blank record field at the bottom. You may need to scroll down with the scrollbar on the right side of the screen to see the blank record.

Figure 3: Manage Virtual Tours



2. Click in the blank white text box at the bottom of the Tour Name column and type the title of the new virtual tour.
3. Click in the blank white text box in the Site Description column and type the description of the site that will appear in the introductory page of the tour.
4. Click on the pull-down bar  in the General View Barcode column and choose or type the barcode of the photo image that will be shown in the introductory page of the tour.
5. Click in the Has Section check box if the tour includes a section of the site. (Having a plan is assumed by default.)

6. Click on the Save Record button  at the top of the screen to save the record change.
7. Click on the Manage Objects button  to go to the next step of assigning coordinates to objects. Or, click on the Web button  to go back to the Web Menu form.

### Step III: Assigning coordinates to objects

Coordinates are a set of numbers that tell the web browser which areas of a plan or section can be clicked on. These coordinates will allow the visitor's web browser to detect the visitor clicked on an object in the tour and show the appropriate pictures. (The areas of the plan or section that represent objects for which the library has photographs should be colorized to give users a sense of where to click. Colorizing a selected area is explained in the Technical Background appendix of this manual.) Each coordinated area will be given a unique object name in the database so that developers can distinguish one selected area from another. This name is displayed in the web site when a web visitor is looking at an object in the tour.

<Figure 4> shows the Object Management form. The following fields are located on this form: Tour, Object Name, History of Object, Description of Architecture, and Plan Coordinates. Also, a Section Coordinates field will appear if the Has Section check box is checked in the Manage Virtual Tour form. The Find Coordinates buttons run the CoffeeCup Image Mapper++ program, which locates areas inside the plan and section. The Tour pull-down bar shows the names of existing virtual tours created in Manage Virtual Tours in Step II. Object Name refers a certain area inside a plan or section with one or more images stored in the database (e.g. 'Temple of Saturn' in the Forum Romanum, the 'Apse' of San Clemente, etc). The History of Object column and Description of Architecture column are descriptions that will be shown in the Virtual Tour web site when a web visitor is looking at a photo of the object. The Plan Coordinate column contains the actual coordinates that locate clickable objects inside a plan. The Section Coordinates column, if shown, locates clickable objects inside a section.

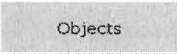
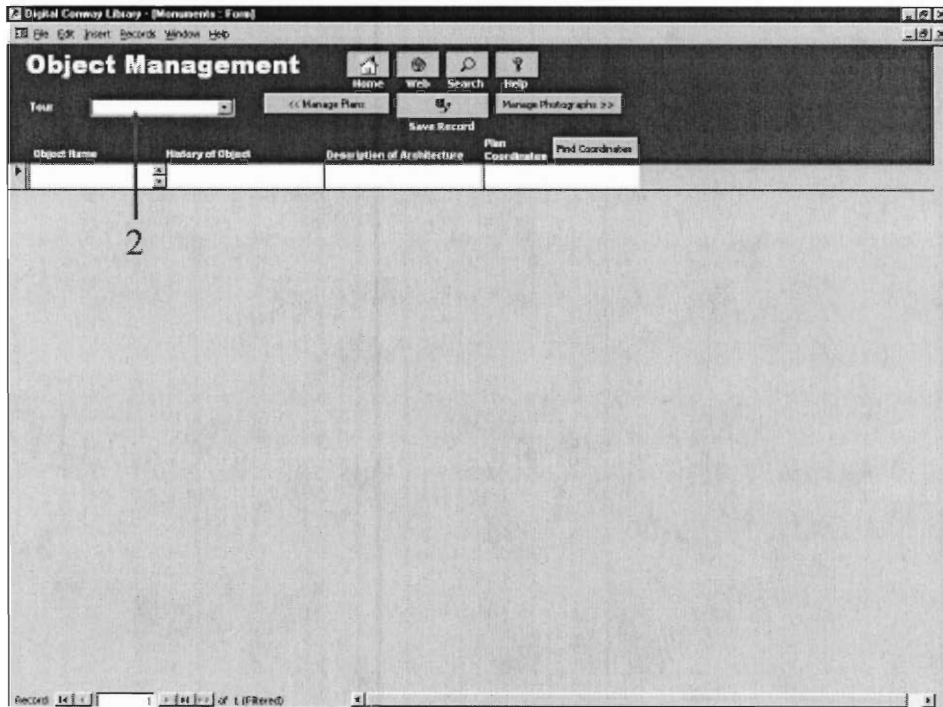
1. If you are in the Web Menu, Click on the Objects button  to access the Manage Objects form <Figure 4>.

Figure 4: Object management (Blank)



2. Click on the Tour pull-down bar  located below the Object Management title and choose a tour in which objects will be assigned from the list. This plan name is the name of the tour created in Step II. If the tour includes only a plan, <Figure 5> will be shown. When the tour contains a plan and a section, <Figure 6> will be shown.

Figure 5: Object Management (without section)

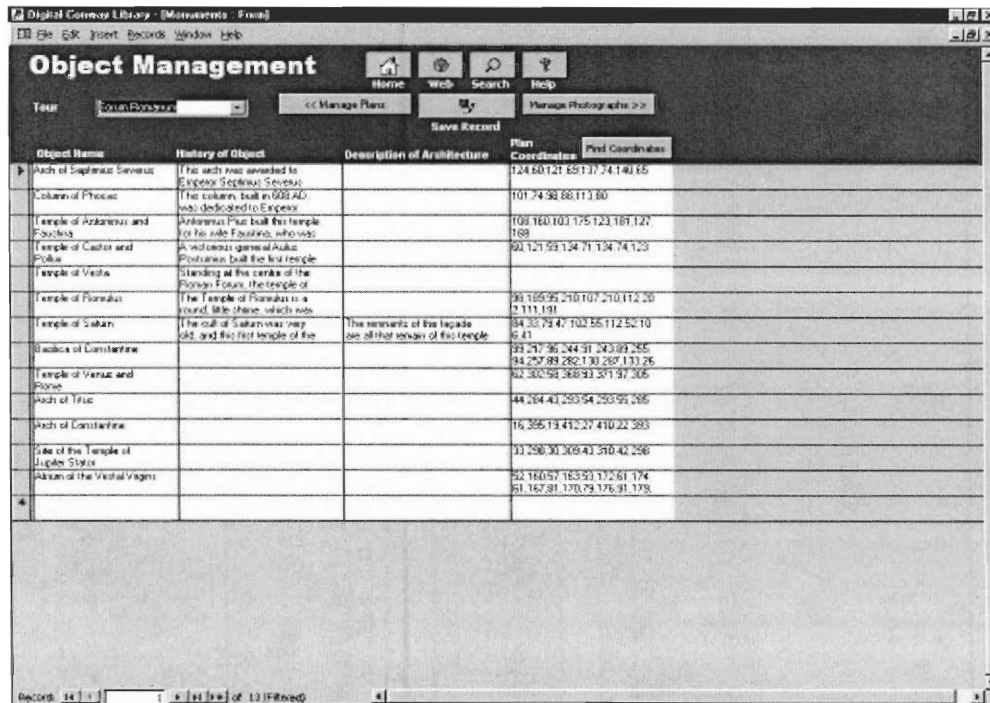
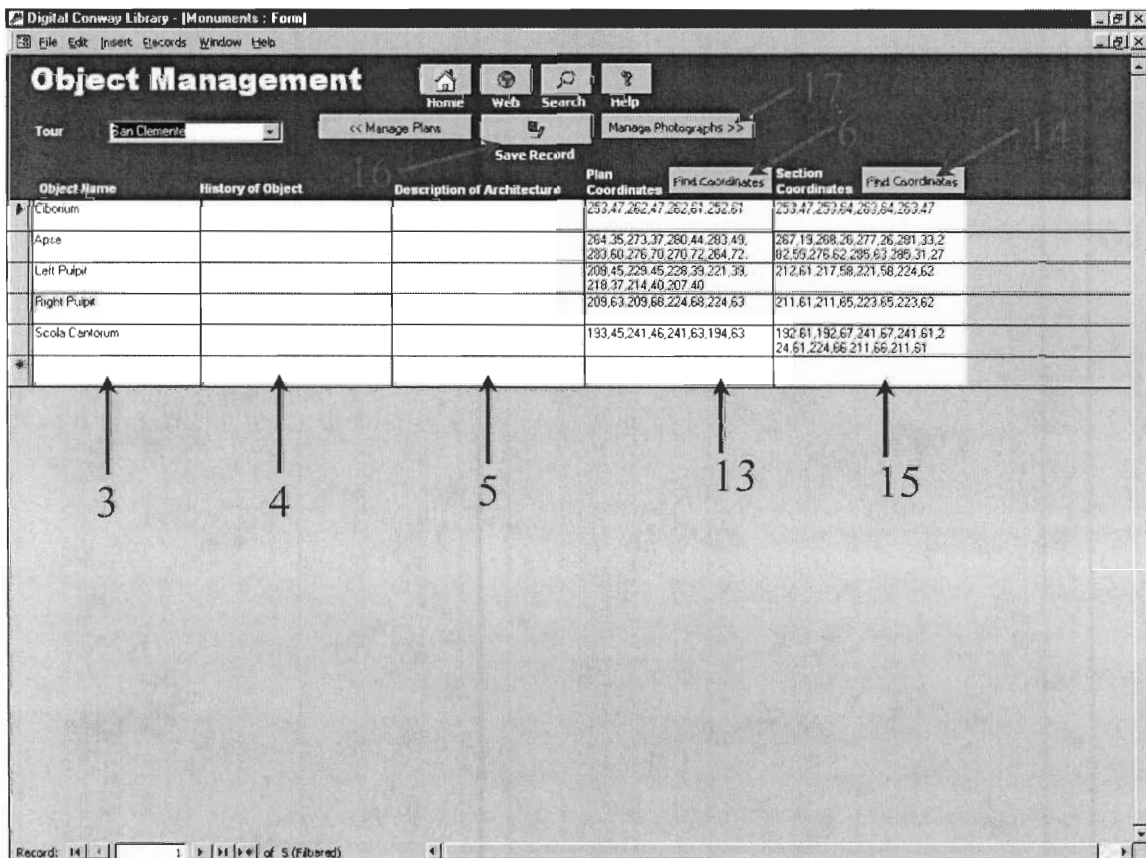
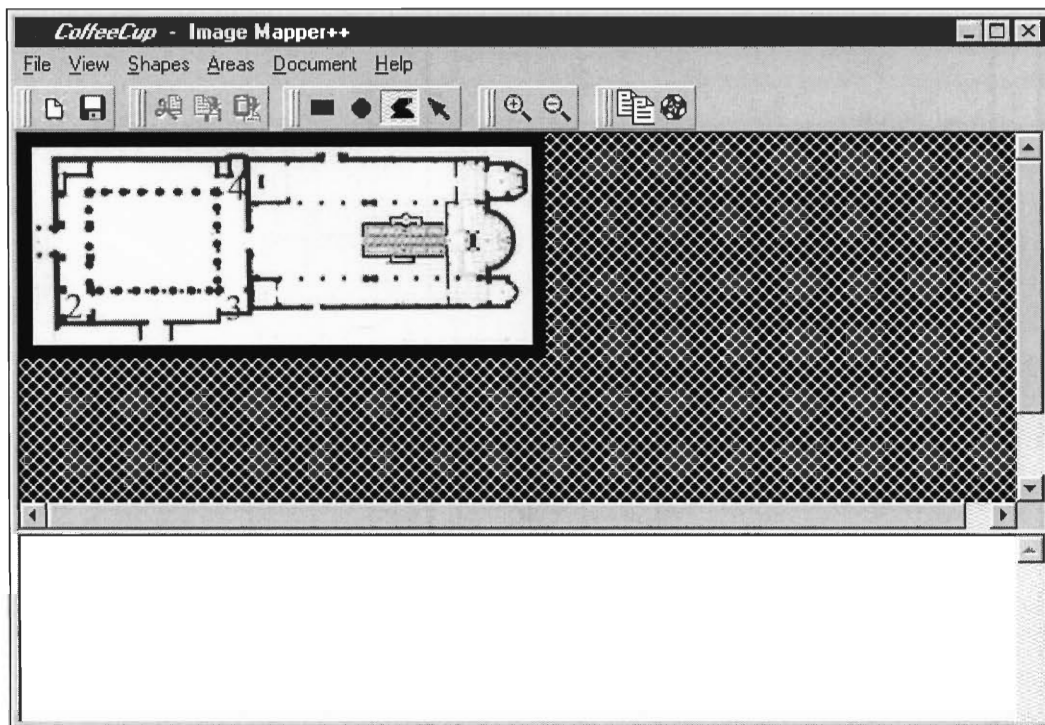


Figure 6: Object Management (with Section)



3. Click on a vacant white text box located at the bottom of the 'Object Name' column and enter the name of the object.
4. Click in the blank white text box in the History of Object column and type in a historical description of the object.
5. Click in the blank white text box in the Description of Architecture column and type in an architectural description of the object.
6. Click on the Find Coordinates button **Find Coordinates** located at the right side of Plan Coordinates to launch the CoffeeCup Image Mapper++ program where the numbers of the image map coordinates can be obtained. The Following screen <Figure 7> will be shown in the screen.

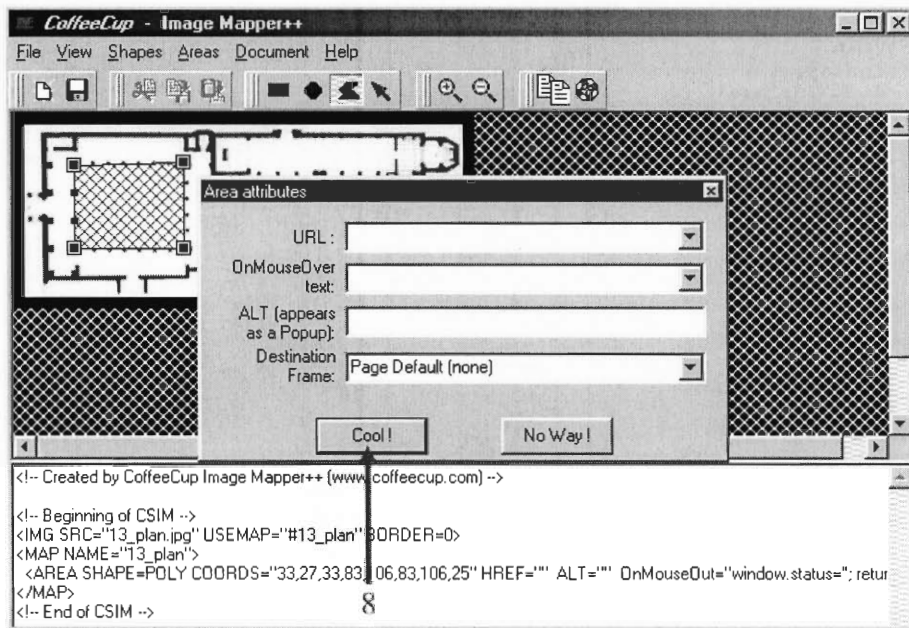
**Figure 7: CoffeeCup Image Mapper++ (Before selection)**



7. Select the area with the mouse pointer by clicking around the desired area. Your last click should be a double-click (two clicks in rapid succession) to enclose the selection. In <Figure 7>, for example, a user is going to select the cloister of San Clemente Basilica (highlighted in blue). The user made the selection by clicking 1, then 2, then 3, and then double-clicking on 4. <Figure 8> will appear.



Figure 8: CoffeeCup Image Mapper++ (After selection)



8. If you are satisfied with the area you have selected, click on the Cool! Button

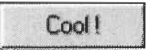
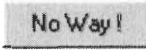
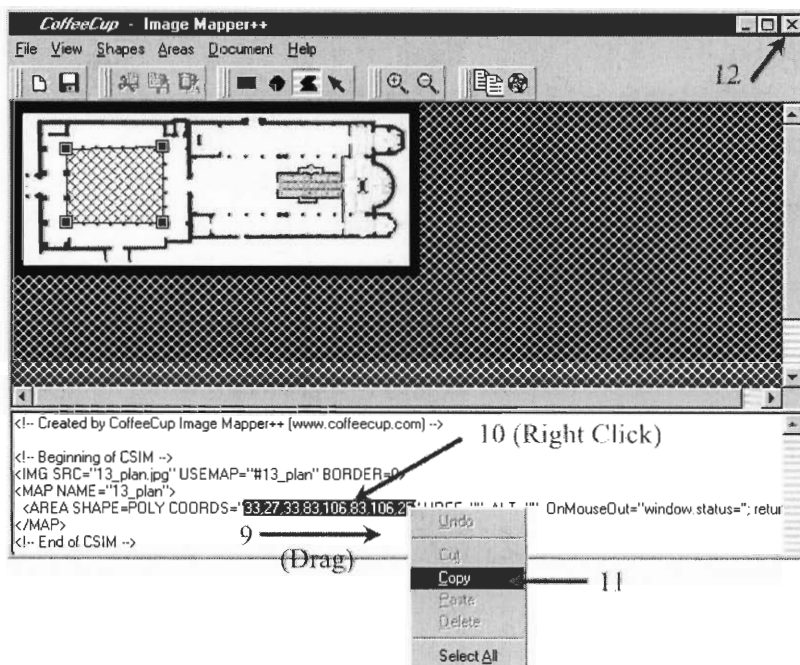




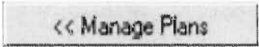
 to confirm that the selection is correct. <Figure 9> will be shown on the screen. Otherwise, click on the No Way! button  to retry the selection in the previous step.

Figure 9: CoffeeCup Image Mapper++ (Copying the coordinates)




9. In the bottom of the CoffeeCup window is a white text area, which will now be full of text (see Figure 9). Find the line that begins with <AREA SHAPE=POLY COORDS=. Select the numbers that follow COORDS= by dragging mouse over the numbers and commas in between the quotation marks. Please DO NOT include the quotation marks in this selection. In <Figure 9>, “33,27,83,106,83,106,25” are the coordinates, which have been highlighted in blue, selected properly (WITHOUT the quotation marks).
10. Right click (click with the second mouse button, on the right of the mouse) on the highlighted numbers and a menu will be shown at the position of the mouse cursor.
11. Click on the Copy menu item and the menu will disappear. This is proper behaviour.
12. Click on X mark button  to close the CoffeeCup Image Mapper++ program.
13. Back in the Access screen, click on the vacant white text box in the Image Map Coordinates column, which corresponds to the object name. Press and hold the *Ctrl* key and press the *V* keyboard key, then release both keys together to paste the numbers that were “copied” previously in the CoffeeCup program.
14. If the tour includes a section, repeat from step 6 to step 13 for the Section Coordinates column.
15. Click on the Save Record button  to store the changes.
16. Repeat all of the steps above until all objects in the tour are assigned and all coordinates are obtained.
17. Click the Manage Photographs button  to proceed to the next step of allocating pictures to created objects. Or, click on the Web button  to go back to the Web Menu form or the Manage Plans button  to go back to the Manage Virtual Tours form, if needed.

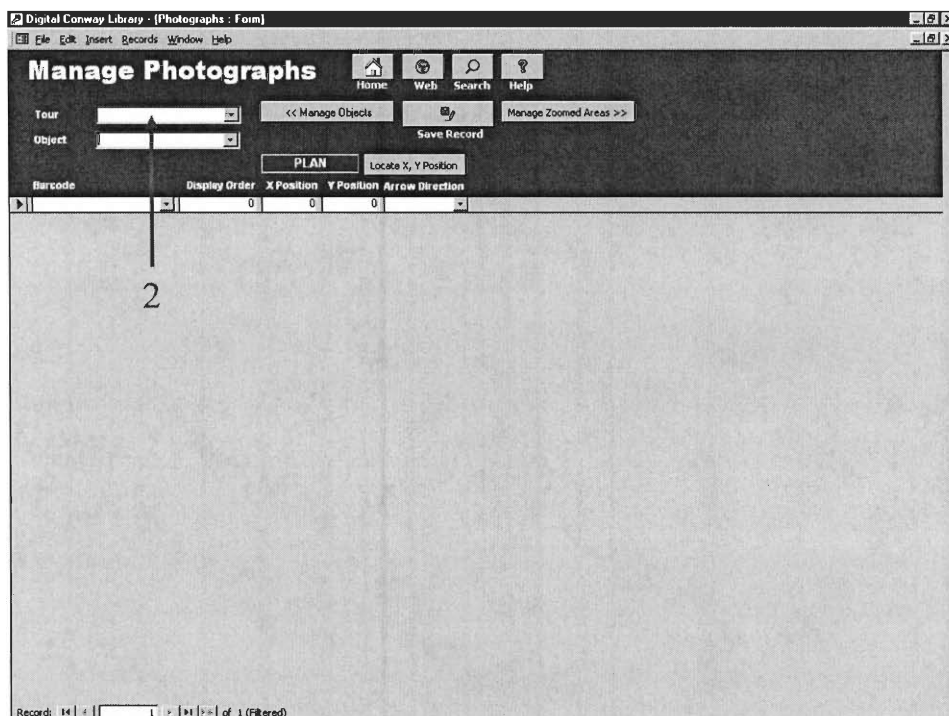
#### Step IV: Allocating pictures to objects and assigning point-of-view arrows

Each object inside a plan or section has one or more photos. Inside the database, these pictures are differentiated by unique barcodes, which are used by the web site programs to reference the proper pictures. Arrows inside a plan or section show from where and in what direction photographs were taken. These arrows’ locations inside a plan or a section are identified by assigning X and Y positions to the arrows. <Figure 10> shows the Manage Photographs form. The Tour pull-down bar is used to choose which virtual tour is to be edited,

and the Object pull-down bar is used to choose the object to which a picture or pictures will be added. The Barcode field refers to the unique barcodes of photographs that are to be attached to the object, and the Display Order field is used to arrange the order in which the photo images are to be displayed in the virtual tour. The arrows displayed on the plan and section in the tour are placed using the information entered into the X Position, Y Position, and Arrow Direction fields. There will be two sets of these fields, one for the plan and one for the section, if the tour has a section.

1. Click the Photographs button  to access the Manage Photographs form if you are in the Web Menu form. <Figure 10>, a blank Manage Photographs form, will appear.

**Figure 10: Manage Photographs (Blank)**




2. Click the pull-down box  next to Tour and choose a virtual tour that is to be edited. Then, <Figure 11> will appear if there is no section image in that tour. Otherwise <Figure 12> will appear, with a section part.

Figure 11: Manage Photographs (without section)

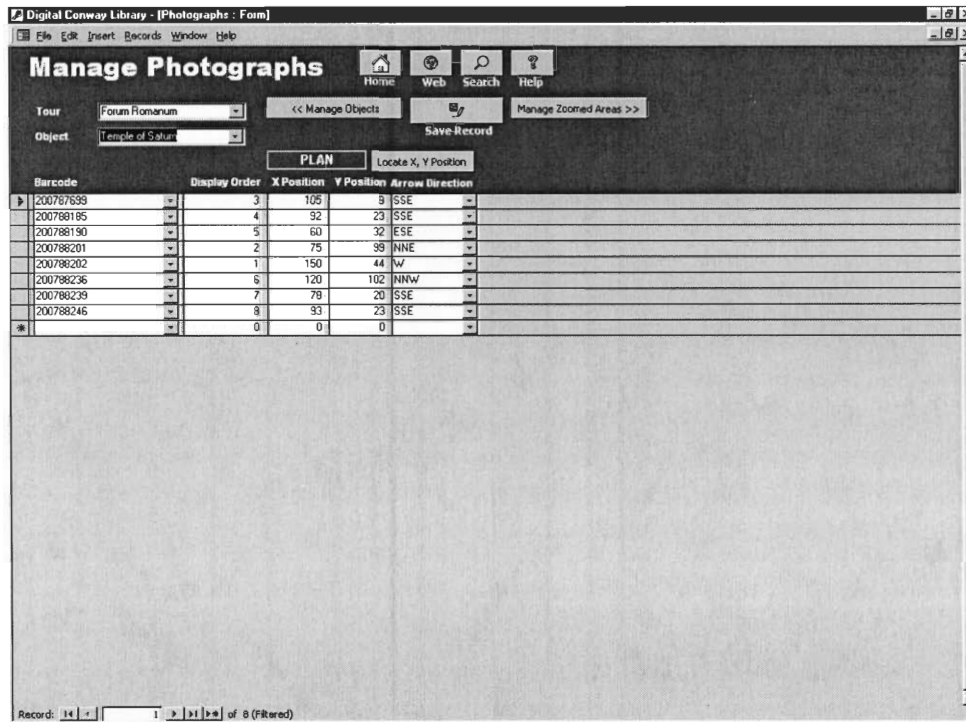
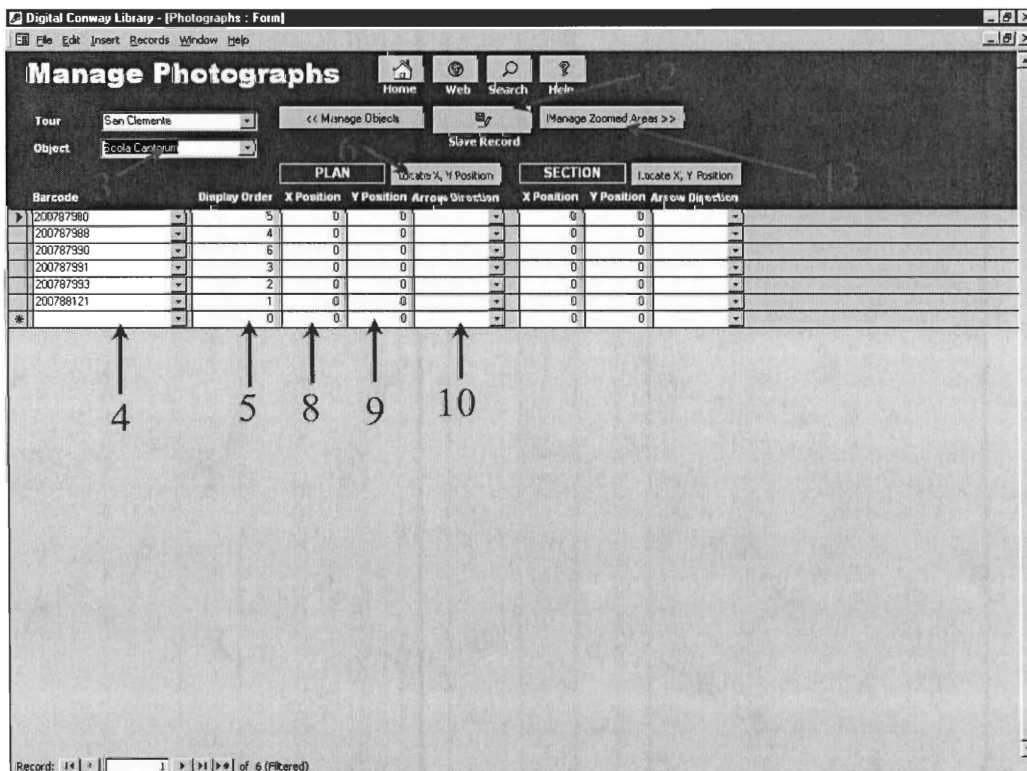
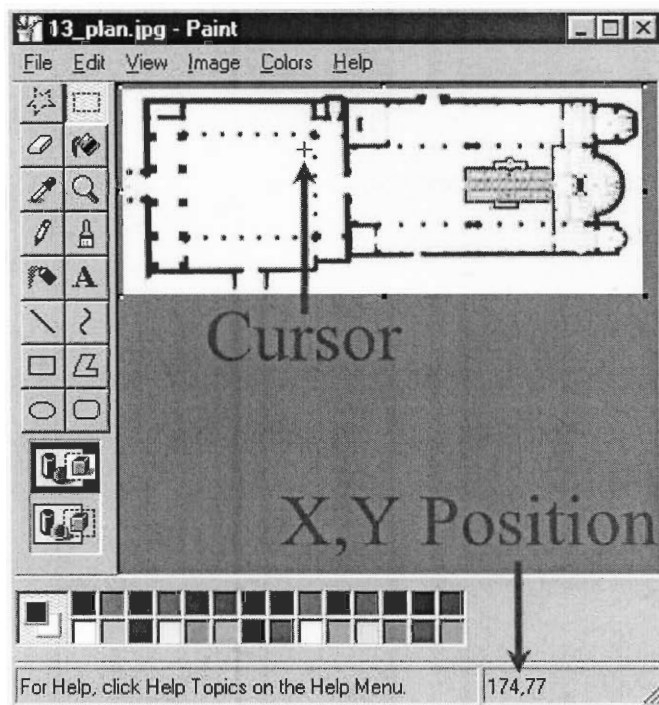


Figure 12: Manage Photographs (with section)





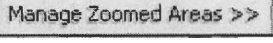

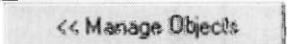
3. Click on the pull-down bar  next to 'Object' and choose an object that is to be edited.
4. Click in the vacant pull-down bar  in the Barcode field and, to add a photograph image to the object, choose the appropriate barcode of the photo.
5. Click in the white text box at the right of the pull-down bar to enter the display order of the photo. The order goes from 1 to the number of photos assigned to the object.
6. Click on the Locate X, Y Position button  under the Plan label to launch the position locator program (MS Paint) that will specify the location of the arrow. See <Figure 13>.

Figure 13: MS Paint



7. Move the cursor in the MS Paint program with plan image in it. As you move the cursor over the plan, numbers separated by a comma in the bottom right of the window will change to indicate the position of the cursor. Move the cursor to the place where the arrow should be located and remember the two numbers. The first number is the X Position and the second number is the Y Position. For example, 12, 45 means that X Position is 12 and the Y Position is 45. Remember those two

numbers and close MS Paint program by clicking on the X mark  at the top right of the window.

8. Click in the vacant box in the X Position field below the Plan label and enter the X Position number you remembered from MS Paint.
9. Click in the vacant box in the Y Position field below the Plan label and enter the Y Position number you remembered from MS Paint.
10. Click in the pull-down box  in the Arrow Direction field below the Plan label and choose the direction that the arrow should point.
11. If the tour has a section, repeat procedures 6 through 10, but below the Section label instead of below the Plan label, to locate and point the arrow in the section.
12. Click the Save Record button  to store the changes.
13. Click the Manage Zoomed Areas button  to proceed to next step of adding zoom-in areas. Or, click the Web button  to go back to the Web Menu form. Or else, click on Manage Objects button  back to the Object Management form.

#### Step V: Adding Zoom-Ins

Each picture can have zoom-in area images that are simply enlarged images of specific areas of the photos. The zoom-in area images are accessible in the virtual tour web site when a web visitor is looking at a large image of a photo. (The creation of zoom-in area image files involves using a graphic editing tool such as Adobe Photoshop or Microsoft PhotoDraw. Making zoom-in area image is described in the Technical Background appendix.) <Figure 14> is a screen shot of the Manage Zoom-Ins form. There is a Barcode field to designate which photo image will have coordinates that will redirect users to zoomed in areas of the image. There is a Zoom Image Filename field, which will refer to the image that will be displayed when the area of the image is clicked. The contents of the Description field will be displayed along with the zoom-in image.

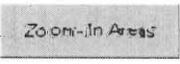
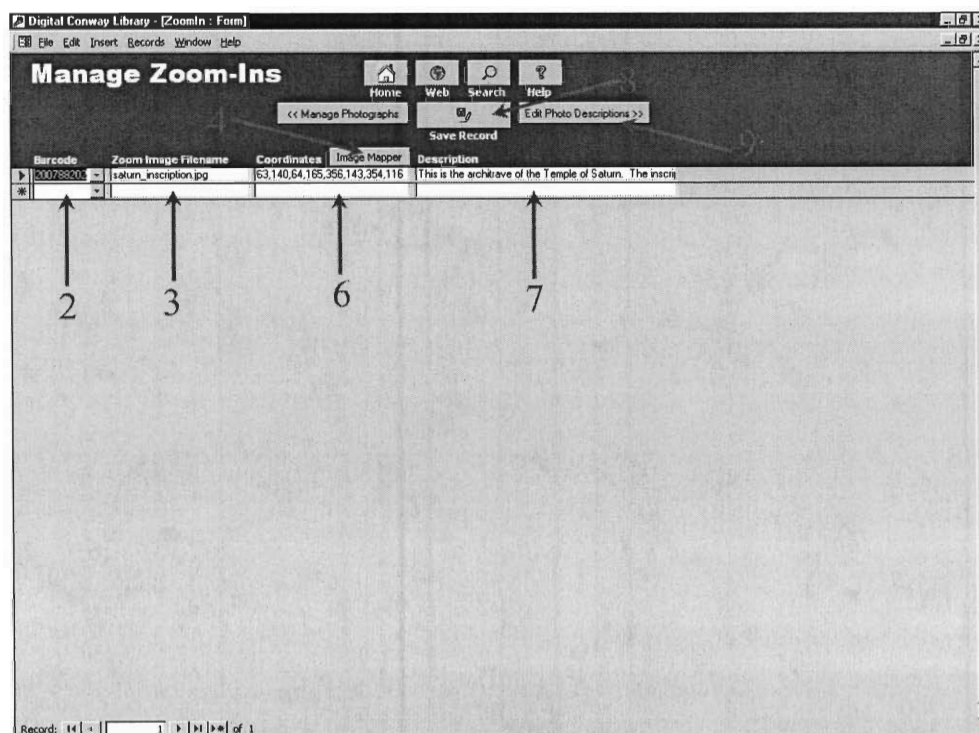
1. Click the Zoom-In Areas button  if you are in the Web Menu to access the Manage Zoom-Ins form. <Figure 14> will appear.

Figure 14: Manage Zoom-Ins



2. Click in the pull-down bar  in the Barcode field and choose or type the barcode of the desired photograph that will have zoom in images.
3. Click in the vacant white text box in the Zoom Image Filename column and enter the file path of the zoom in image. (The creation of Zoom In images is explained in the Technical Background appendix of this guide.)
4. Click the Image Mapper button  to run the CoffeeCup Image Mapper++ program to retrieve the coordinates for image mapping.
5. Follow procedure 7 to 12 of step III to copy the coordinates of desired area of the image that will be zoomed in.
6. Click in the vacant white text box in the Image Map Coordinates column that corresponds to the object name. Press and hold the *Ctrl* key and press *v* key, then release both keys together to paste the numbers that were copied in step 5.
7. Click in the white vacant text box in the Description column and type a description that will appear together with the zoom in image in the virtual tour web page.
8. Click the Save Record button  to store the changes.

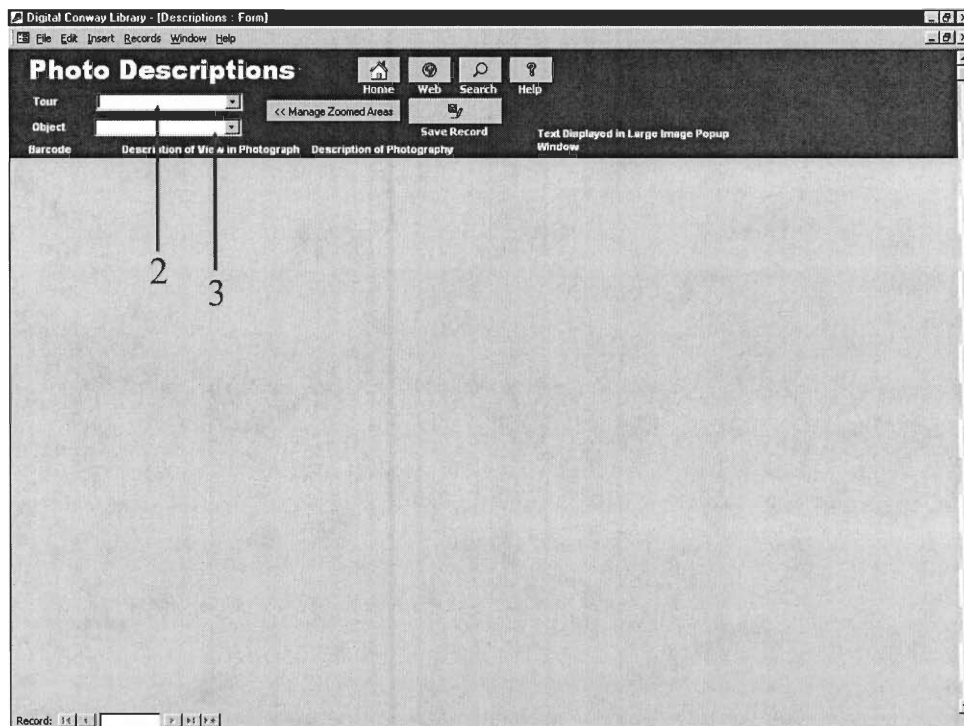
- Click the Edit Description button  to go to next step of writing descriptions for the photographs. Click on the Web button  to go back to Web Menu form. Or, click on Manage Photographs button  to go back to the Manage Photographs form.

### Step VI: Writing descriptions for each picture

Each picture has its own Description of View in Photograph, Description of Photography, and Text Displayed in Large Image Popup Window. If there are no descriptions at all for a photo, the web site will not show any text except the title and the short descriptions that are already stored in the database.

- Click the Descriptions button  if you are in the Web Menu to access the Photo Descriptions form. <Figure 15> will appear.

Figure 15: Photo Descriptions (Blank)





- Click in the pull-down bar  next to Tour to choose which virtual tour to edit.



- Click in the pull-down bar  next to Object to designate the object to which the pictures belong. Then, <Figure 16> will be shown with a list of pictures of the object.


Figure 16: Photo Descriptions (With photographs)

Barcode	Description of View in Photograph	Description of Photography	Text Displayed in Large Image Popup Window
200788234		8	
200788185			
200788190		7	
200788201			
200788202	This is a view from the east of the Temple of Saturn, looking to the west. Only the front columns of the temple remain standing. The three	This photograph is part of the collection of one Hackley. The library is still unsure of exactly who Hackley was, but he collected fantastic photographs. The photograph was	This is an elevation of the front (East) side of the Temple of Saturn. You may click on the architrave (the beam across the top of the wider monument in the picture) to see a
200788236			
200788239			
200788246	4	5	6
*			

- Click in the blank white text box in the Description of the View in the Photograph column. Type a description of the view in the photograph.
- Click in the blank white text box in the Description of Photography column in the same row as in procedure 4 and type a description of the photography for this photo.
- Click in the blank white text box in the Text Displayed in Large Image Popup Window column in the same row and type in the text message that will be displayed when the larger image is summoned. This description should tell the user where they can click to see zoom-in images, if any have been created in Step V for this photograph.
- Click the Save Record button  to store the changes.
- Click the Home button  to go back to the Main Menu.

## ***Editing and Deleting Records in a Virtual Tour***

### Editing Records

This web development tool provides a very simple and easy to learn editing method for the Virtual Tour. The modification of the data record can happen in any form from the Manage Virtual Tours form to the Photo Descriptions form. The procedure is the same as for creation except that the user is not making a new record but is clicking on existing data in the forms and altering the data. Use the menus to navigate to the form you want to make changes to. Edit the information in the form or add a new record at the bottom of the form (in the blank record). Then, click the Save Record button  to store the changes.

### Deleting Records

To delete a data record, first go to proper form. For example, to remove a photograph of an object from those that are displayed in the tour for that object, go to the Manage Photographs form and choose a tour and an object in the pull-down bars at the top of the form. Next, click the grey area in the leftmost column of row you wish to delete. <Figure 17> shows a clicked leftmost part of the list. In this example, the fourth row is to be deleted. The leftmost column, now populated with an arrow, of the fourth row is highlighted in black. This means that the entire row is selected for deletion. Finally, press *Delete* key on the keyboard (on some keyboards this is the *Del* key) to delete the record.

Figure 17: Deleting a record

Manage Photographs

Tour: Forum Homenum  
Object: Temple of Salun

Barcode	Display Order	X Position	Y Position	Arrow Direction
200787639	3	105	9	SSE
200788185	4	92	23	SSE
200788190	5	60	32	ESE
200788201	2	75	99	NNE
200788202	1	150	44	W
200788236	6	120	102	WNW
200788239	7	78	20	SSE
200788246	8	93	23	SSE
*	0	0	0	

Click on Leftmost column of desired row

Record: 11 of 8 (Filtered)

## ***Appendix: Technical Background***

### How the tour works

The virtual tour consists of two components, the web pages and the database. The web site interacts with users to get input from them such as clicks and it also shows output in a web page form. The database stores data needed for the web site and supplies the pages with the appropriate data. Once a user clicks on the image map of the plan, the web page asks the database which object the mapped area refers to and fetches the image and texts for that object.

### Folder Structure

The database is found in two places. This is to ensure two things: first, that the web site is accessible even when changes are being made to the database's contents; and second, that a usable version of the database always resides in the web folder. In this way, a database can be tested for validity before being published to the web site, and a backup copy of the database is stored in the web folder, so if the database is destroyed or many records are accidentally deleted, a good copy is preserved from which to recover.

The database that the librarians edit is found on the Conway Server in the C:\Databases folder, with the filename conway.mdb. The version of the database that the web site retrieves its information from is found in the C:\Inetpub\wwwroot\db folder with the same name. This file is not readable by any user except the Inetuser, which is the web server's user account. It is writeable, however, by the Conway user so that librarians can publish the database they have been working on to the web. A script that publishes the web site is found on the Conway Server in the C:\Inetpub\wwwroot\db folder called publish.bat. It is recommended that any computer from which a librarian will need to edit the database have shortcuts to the editable database \\Conway\C\Databases\conway.mdb and the publish script \\Conway\C\Inetpub\wwwroot\db\publish.bat on the desktop and in the shortcut toolbar next to the start menu if the machine has Windows 98 or a more recent version.

To edit the database to make changes to its structure, a trick is used to open the database in administrator mode. Hold the shift key down while Microsoft Access loads (begin holding it before running Access and keep it held down). This will bypass the forms we have created and take you to the normal Access window. Remember, only make changes to the conway.mdb

database found in the C:\Databases folder, and publish the changes only with the publish.bat script in the db subfolder of the wwwroot folder.

The web site is complex. All web site files are found in the C:\Inetpub\wwwroot folder. The obfuscated name helps to ensure that a computer user does not arbitrarily remove files from this folder that don't seem important. Every file in this folder is necessary for the web site to function properly. For example, the file coffeecup.wsf in the db subfolder of wwwroot is necessary for certain functions of the Access interface to work. Please do not remove any files from this folder. Most files in this folder are well commented. I have taken much pride in creating very clean and readable code that should be clear. I hope you find that if you need to change any code, you will be able to learn the JScript ASP, JavaScript, HTML, and SQL languages quickly and to edit these files to make the necessary changes from my examples.

The folders in wwwroot that you will need to be familiar with are the plan\_images and zoom\_images folders. Plan\_images contains images of plans and sections. The number in the filename must be the Plan\_Key number for the corresponding plan in the Plan table of conway.mdb. The number must be followed by either \_plan.jpg or \_section.jpg. Because of the way the Access scripts are written, these must be JPEG images and must have these names exactly as just described. This could be changed by someone comfortable with Microsoft Access and VBScript if it is found to be too restricting. These images must be sized to the absolute size to be displayed on the web page. This is because of a limitation in most HTML browsers in image mapping. Dynamically sized images require dynamically altered image coordinates, which was beyond the scope of this project. The zoom\_images folder contains the name of zoom-in images of areas of the photographs in the database. The ZoomIn table in Access contains information that includes the filenames in this folder, without the folder information preceding it (for example, "saturn-architrave.jpg", not "zoom\_images\saturn-architrave.jpg). Zoom-in images must have one-word names (dashes are OK) and must be placed in this folder, and the name of the files given to a librarian to be entered into the database. These images ARE dynamically sized on the web page, to 100% of the popup window width, so you may use fairly high quality images of arbitrary size, just cropped to the correct area of the photograph. These files do not HAVE to be JPEGs, but they must be supported by most web browsers (JPEG, GIF, PNG are OK).

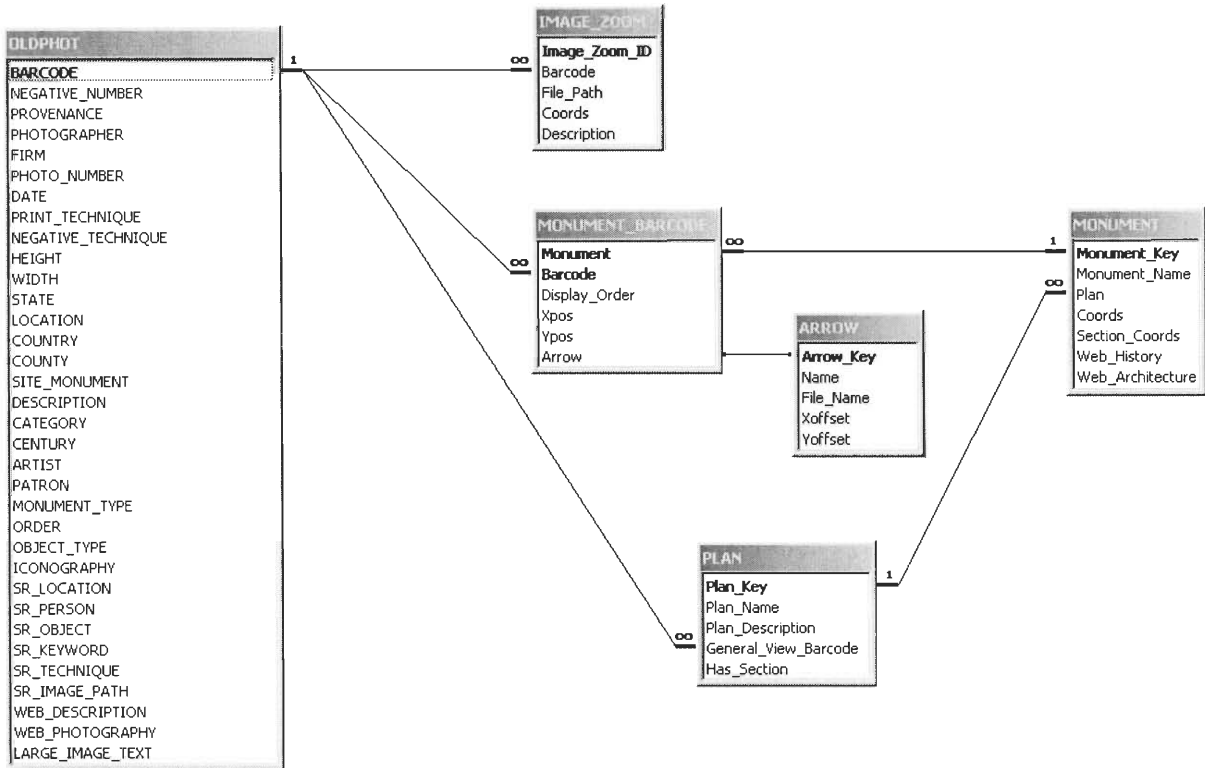
## The Conway Web System: System Structure and Computer Languages

The Conway web system is a complex system. Breaking it logically into subsystems makes it easier to understand how this system operates. The system consists of two databases, one in Access and one in FileMaker; Microsoft's Internet Information Server (IIS) web server and FileMaker's built-in web server; and CDML (FileMaker's proprietary web scripting language) and a collection of JScript ASP web scripts that generate web pages dynamically by communicating with the two databases. The reason for the divide between the two systems (one using Microsoft technology and one using FileMaker technology) is due to time constraints between two different digitisation pilot projects at the Conway library; it is the intention of the library to move the system completely over to Microsoft technology (Access, IIS, and JScript) in order to ensure flexibility for future ideas for the web system, as well as to put the library in a better position to change systems if necessary in the future, by using more standard technologies such as Java, SQL, and XHTML/XML (all open standards that are accepted across the entire computer industry).

The Conway Library has three major digital collections: Historic Photography, Manuscripts, and Architecture. At the time this report is written, the library is in the process of moving all three systems over to Microsoft Access, but only the Historic Photography collection has been converted so far. The other two collections are driver using FileMaker's built-in web server and CDML scripts written by a group of Worcester Polytechnic Institute students in the spring of 2001. Those databases and scripts are beyond the scope of this document; this document covers only the Microsoft Access and ASP portion of the digital collection: currently only the Historic Photography collection.

The Conway database, located in C:\Databases\conway.mdb on the Conway Server, contains many Tables and Forms. The Forms were created to allow a librarian to easily enter information into and edit information in the database. In order to change the design of either the tables or the forms, hold down the shift key while opening the conway.mdb file. A snapshot of the relationships between the Tables and their Fields is shown below, in <Figure 18>.

Figure 18: Conway Database Relationships



ASP scripts written in JScript generate the web pages that are sent to the client. These scripts are found in C:\inetpub\wwwroot on the Conway Server. Microsoft’s reference for the JScript language can be found by clicking on JScript then Documentation on the left sidebar menu at <http://msdn.microsoft.com/scripting/default.htm>. A good reference for ASP objects can be found at <http://www.learnasp.com/>. These scripts use SQL to make requests from the database. A good reference for the SQL language can be found at <http://w3.one.net/~jhoffman/sqltut.htm>. The JScript scripts generate HTML code that is compliant with the XHTML 1.0 standard. The official reference for the HTML 4.01 standard upon which XHTML 1.0 is based can be found at <http://www.w3.org/TR/html4/>. The differences between HTML 4.01 and XHTML 1.0 can be found at <http://www.w3.org/TR/xhtml1/>.

## Colorizing Clickable Areas

Colorizing clickable areas of plans and section is necessary because it is important to let users notice which part of plan or section image they can click on. Our interviews with and observations of art and history students and teachers have shown that it is not sufficient to depend on the user to hunt around the plan and notice when the mouse cursor changes to a hand or the status bar shows the name of an object in the plan or section.

The colorizing procedure requires some knowledge of computer graphic tools. In this project, the colorizing was done with the Adobe Photoshop program and this manual is based on the assumption that the same program would be used to colorize the image. The procedure consists of 4 steps.

### Step I: Making the Image Black and White

1. Run Adobe Photoshop
2. Open the plan or section image file on Menu (File → Open) and choosing image file.
3. Make the image file to greyscale (black and white) by choosing on Menu (Image → Mode → Greyscale)

### Step II: Making Image Back to RGB

1. Make the image file back to RGB format on Menu (Image → Mode → RGB colour)

### Step III: Selecting Area that will be colorized

1. Click on Lasso button or press 'L' key on keyboard to use Lasso selecting tool (Polygonal Lasso is recommended)
2. Select the area where you want to colorize by clicking around the area.

### Step IV: Colorizing with Hue/Saturation Tool

1. Choose Hue/Saturation tool by choosing on Menu (Image → Adjust → Hue/Saturation) or pressing 'Ctrl' + 'U'
2. Click on the 'Colorize' check box at bottom left
3. Move the 'Hue' bar all the way to the left to make the selected area red



4. Adjust the 'Lightness' bar to make it an acceptable brightness (blacks should be lightened, light greys darkened, etc).
5. Save the image file as a JPEG file on Menu (File → Save a Copy) in the \\Conway\C\Inetpub\wwwroot\plan\_images folder (C:\Inetpub\wwwroot\plan\_images on the Conway Server) and close the application.

### Creating Zoom-In Images

Making zoom in images requires some knowledge of computer graphics and, in this project, is done using Adobe Photoshop. Basic concept of zoom-in image is a simple partial image of not resized original JPEG file. Zoom in images are necessary to show users detail on the web where zoom in and zoom out ability is not allowed. Making zoom in image file consists of simple 3 steps.

#### Step I: Open Original JPEG file

1. Run Adobe Photoshop
2. Open original JPEG file on Menu (File → Open) and choosing proper file

#### Step II: Select the area

1. Press 'C' key on keyboard or click on Marquee icon to change it to Crop tool
2. Draw a box around the area where the zoomed image will be made of

#### Step III: Crop the file and Save

1. Crop the image by pressing 'Enter' or Double-clicking in the selection
2. Save the image as a JPEG with a one-word (dashes are OK), descriptive filename in the File Menu (File → Save a Copy) in the \\Conway\C\Inetpub\wwwroot\zoom\_images folder (C:\Inetpub\wwwroot\zoom\_images on the Conway Server) and close the application.
3. Give this filename, complete with .jpg but without the folder information, to a librarian, to be entered into the Zoom-In Areas form of the database.

## Terminology

- ASP:** Active Server Pages: Microsoft's solution for generating web pages dynamically by communicating with databases or other sources of information. ASP scripts are run on the web server, and their output is sent to the web visitor's browser. In many cases, this output may consist of client-side code that runs in the visitor's web browser. Many different scripting languages can be used with ASP technology; the Conway web system uses the JScript language.
- Click:** To press the primary (left) button on a mouse. To click "on" something means to press this button while the mouse cursor is pointing to that item.
- Code:** Slang for any computer language. These are the instructions that tell the computer what to do and when to do it.
- Database:** A collection of information which is stored in an organized manner in a computer system. This information can be retrieved using various searching methods and sorted by fields. Databases consist of Tables of information, stored in Fields (columns) of the Table. Each entity (such as a plan or monument) occupies the fields of one row of a Table.
- Database Relationship:** Virtual tour web site extract necessary data from 'conway.mdb' database and there are a lot of tables. To understand how the tour program works, one should understand how those database tables are interrelated. These relationships can be viewed by choosing Tools → Relationships in Microsoft Access (only in Administration mode – see Figure 18).
- Double Click:** To click with the primary (left) mouse button twice in rapid succession.

- HTML:** Hyper-Text Markup Language: the computer language for web pages on the world wide web. HTML tells a web browser what font to use for text, where to place text and images, and where to go when the user clicks on various objects.
- Image Map:** A special type of image in a web page which has “hot” areas which can be clicked on. When a hot area in an image map is clicked on, a web user’s browser retrieves a new web page. This is how the plans and sections work in the Conway web system.
- JavaScript:** A computer language that runs in a visitor’s web browser, allowing control of many browser functions, such as directing the browser to new pages, opening and closing windows, and filling out form contents automatically and submitting them to the web server.
- JScript:** An ASP computer scripting language that runs on a web server when a web page is requested. Many languages could be used; JScript is a Java-like language that is in use in the Conway web system. JScript allows the easy retrieval of information from a database using the SQL language and the dynamic generation of web content to be sent to a web visitor’s browser.
- Object:** In the Conway database, the Object table contains the names of Objects (such as monuments or paintings), the Tour in which they are found (such as the Forum Romanum or the San Clemente church), the coordinates of the image-mapped area of the plan that brings the web visitor to the Object, and other Object-specific information.
- Oldphot:** This table is imported from FileMaker Pro database management system and sorted with unique barcode for each picture. This tale contains all the technical information about corresponding picture including barcode, short description, file path and so on.

- Plan: This table contains what plan a virtual tour uses.
- Right Click: To click with the secondary (right) mouse button.
- Selection: Selections are made by clicking and holding down the primary (left) mouse button at the beginning of the desired text and dragging the mouse cursor to end of the text, releasing the mouse button at the end of the selection. The text will be highlighted, usually in blue. Selections are made in order to “copy” the text for later “pasting” into other areas of a form or into other programs.
- SQL: Structured Query Language: a computer language used to request data from databases. In the Conway web system, JScript web scripts generate SQL statements to make requests for information from the Conway database.
- Table: Information in databases is stored in Tables. A separate Table has been created for each type of entity that the Conway web system uses, such as Tours, Objects, and Photographs.
- XHTML: The extensible Hyper-Text Markup Language. This is the latest standard of HTML recommended by the World Wide Web Consortium (W3C). See <http://www.w3.org/>.