The Accademia Pilot Project in Hadrian's Villa near Tivoli (Rome, Italy).

Problems in Archiving Ancient and Modern Data.

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Abstract: After several years of work we had to find the best way to archive, process and retrieve an enormous amount of data coming from antiquarian and modern sources and from our survey in the Accademia. Here we discuss the difference between "real" documents on paper versus "virtual" digital ones, and related problems of preservation of data in the future.
We cannot offer perfect solutions, but we wish to share our experience with other scholars, looking for comments and suggestions.

Keywords: Cultural Heritage, New Technologies applied to Archaeology, Archiving.

Fig. 1 - A general view of the Accademia: on the right the upper floor of the *Apollo's Temple* (Copyright: Marina De Franceschini)

Foreword

During the past years I have been working in the Accademia Pilot Project, concerning one of the lesser known buildings of Hadrian's Villa (near Tivoli, Rome), the Accademia (fig. 1), which is located on its highest artificial terrace. Since the XVII century it belongs to the Bulgarini's, who live there and very kindly give permission to scholars to study the site, which is not open to the public[49].

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[49] I wish to thank Mrs. Daniela Bulgarini for giving me permission to study and survey the site.

As I wrote in the abstract, we cannot offer perfect solutions: we will talk about the archiving problems we met during our research, and showing how we tried to solve them.

Our Project consists of five major phases:
- *Phase 1* - collection of previous bibliography, documentation, ancient texts, books and manuscripts, and also of maps, plans, drawings, engravings, old pictures.
- *Phase 2* - a general survey of the site with *Total station*, GPS and *Laser scanner*: to draw a new updated plan and check the previous ones.
- *Phase 3* - geophysical survey: to detect the walls that are not visible any more but are known from antiquarian plans, and to trace back the network of subterranean service tunnels.
- *Phase 4* - remote sensing, *Lidar* and infrared pictures: to detect other buried structures, roads, paths, retaining walls.
- *Phase 5* - data processing, 3D reconstruction, virtual visits, paper and on-line publications.

Hadrians' Villa is a special case study, where humanistic and scientific approach both have the same importance. It is impossible to understand the site without knowing what has been studied before us, since in the past centuries many structures were in a better state of preservation. Ancient sources still give us precious hints to understand what we see today: without their guide and descriptions our work would be much more difficult.

The most recent plans of the Accademia date back to the 1950's and 1980's, while the "real and complete plan" of the whole Villa still is a task that was never accomplished. After more than five centuries of study there is a great amount of work to do to understand the meaning and function of the buildings.

Information is varied and different: we have antiquarian and modern plans (fig. 2), sketches made on the site dating back to the XV century; engravings and drawings, ancient and modern pictures; Renaissance manuscripts, letters, old books and recent publications (fig. 3). All this documentation can can now be scanned and easily stored in a data-base.
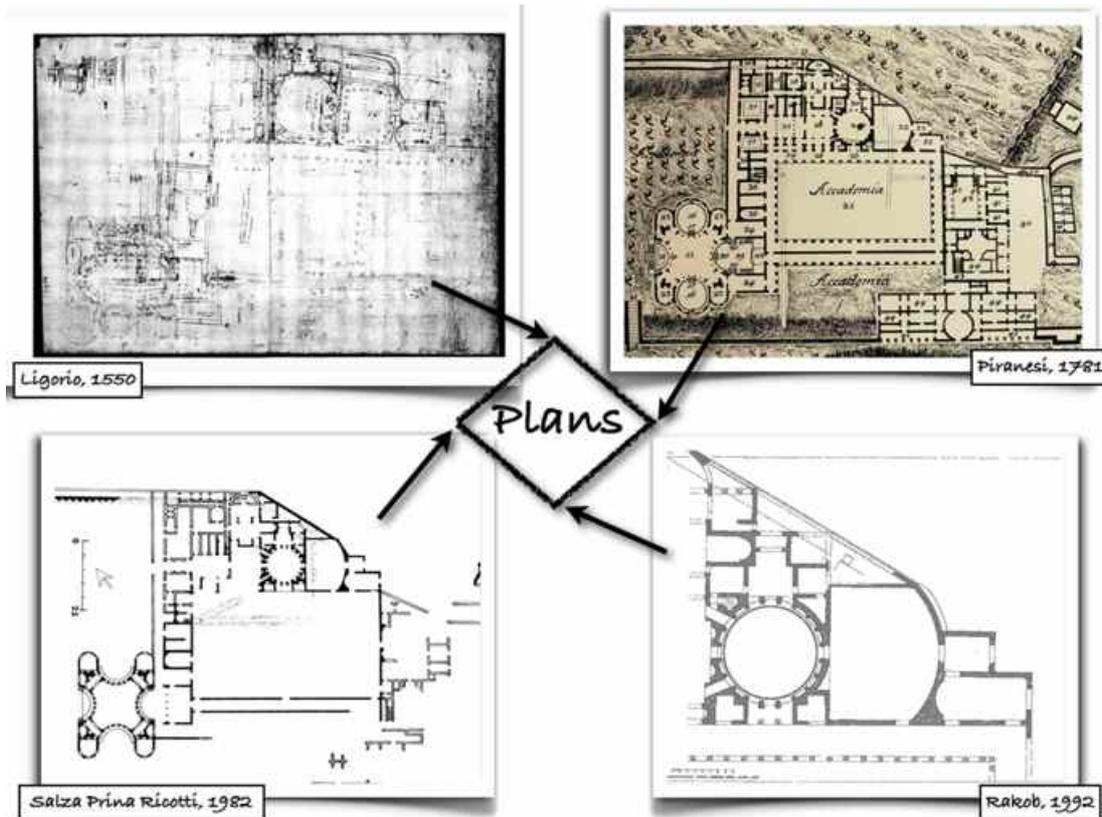
Fig. 2 – Plans of the Accademia: a selection of antiquarian and modern plans.

Alongside with previous sources, we have new sets of data coming from our work on the site. First of all, the topographical survey made with *Total Station*, GPS and *Laser Scanner*, and the results of our geo-electrical survey: we used a geo-resistivimeter to explore the network of subterranean service tunnels. We produced several thousands of digital pictures, and also movies made with a video-camera, which is the best way to show the work in progress: from the initial suppositions to the final hypothesis stemmed from our increased understanding of the site.

In the future we will proceed to Phase 4 and 5: *Remote sensing*, gathering other data coming from aerial infrared pictures and *Lidar*; 3D reconstructions and virtual visits of the site.

Our main problem, therefore, is Archiving: we need an effective way to store, manage and retrieve this varied array of information, making the most of our work.

The revolution of information technology

Today information technology is given for granted, but it changed completely our way of working. When I wrote my first book on Hadrian's Villa (published in 1991) the era of information technology had just begun: I used the first Mac, with 500k floppy disks and a vectorial drawing program of 89k.

At that time access to ancient documentation was difficult: antique plans had to be photographed by professionals, and no detailed pictures were available. Today, with digital pictures we can have 'custom made' images, we can choose and enlarge details, and comfortably study the plans on the screen of our computer, seeing and understanding so much more.

Fig. 3 – Antiquarian sources: books from the XVIII to the XX centuries.

Old manuscripts and books had to be transcribed by hand or photographed by professionals. Today it is possible to send an e-mail to the Vatican Library and order a copy of a XVI century manuscript without traveling to Rome; many ancient books have been scanned and can be found on the internet. This is a great revolution.

Personally, I was one of the first two "*subversives*" who entered the German Archaeological Institute of Rome with a laptop: we were confined in a remote corner on the fourth floor, because "*the noise of the keyboard disturbs the other scholars!*". Today, nobody is going to a Library without a computer and a digital camera...

In 1991 we used to work with theodolite, but there were no *Total Stations*, GPS or *Laser scanners*. Drawing sections and elevations was an expensive and time consuming work. As far as 3D is concerned, plastic models were the only available option; today we can make virtual visits, showing both the actual state and the original appearance of the buildings.
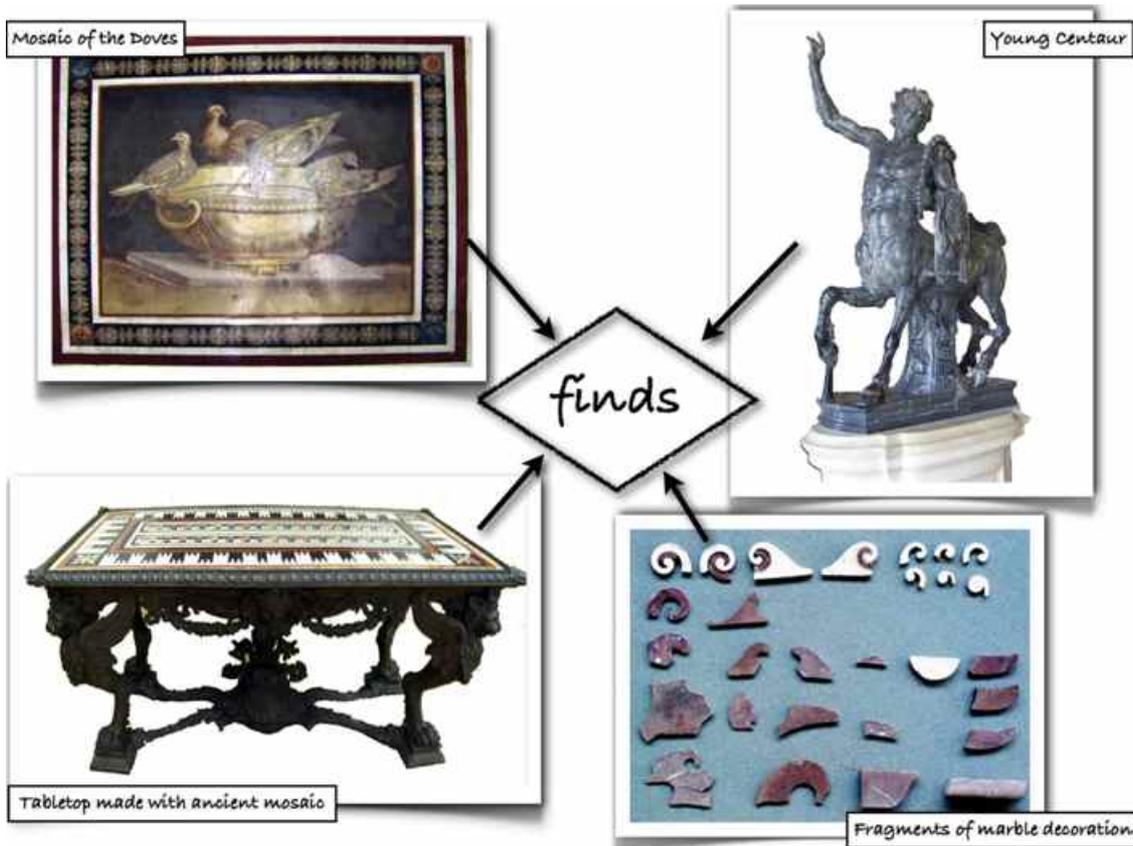
Fig. 4 – Finds: mosaics, sculptures, marble fragments found in the Accademia (Copyright: Marina De Franceschini)

The other side of the medal

But *not all that glitters is gold*: technology is *not* the perfect magic that will solve all problems. It certainly made our work easier (although in measuring the Accademia we must get at grips with the olive grove: there always was a tree standing in our way, and no shortcuts were allowed).

New technologies applied to archaeology opened a new path, but sometimes it seems that data collection became a goal by itself, with a "*let's start measuring and then we will see*" approach. It is important to point out that *quantity of data does not automatically mean quality:* information is useless without interpretation, understanding and publication. A long work still is necessary to draw new plans, maps and sections; an even longer one is required to explain the function of each building, its history and meaning.

Compared to the pre-digital era, we now have an unprecedented amount of data, and archiving became a difficult task by itself.

Just to give an idea of how this is a "*never ending story*", let us look at a catalogue entry concerning "Finds" in the Accademia. For example, we have the famous Dove Mosaic, with an extensive bibliography, a series of engravings, even the letters of Cardinal Alessandro Furietti who discovered it in 1737. Several fragments of its frame (dispersed in Museums and Collections) require further description and bibliography. The same happens with sculptures, with table-tops made with fragments of ancient mosaics, or with marble decorations, all with pictures, history and bibliography (fig. 4).
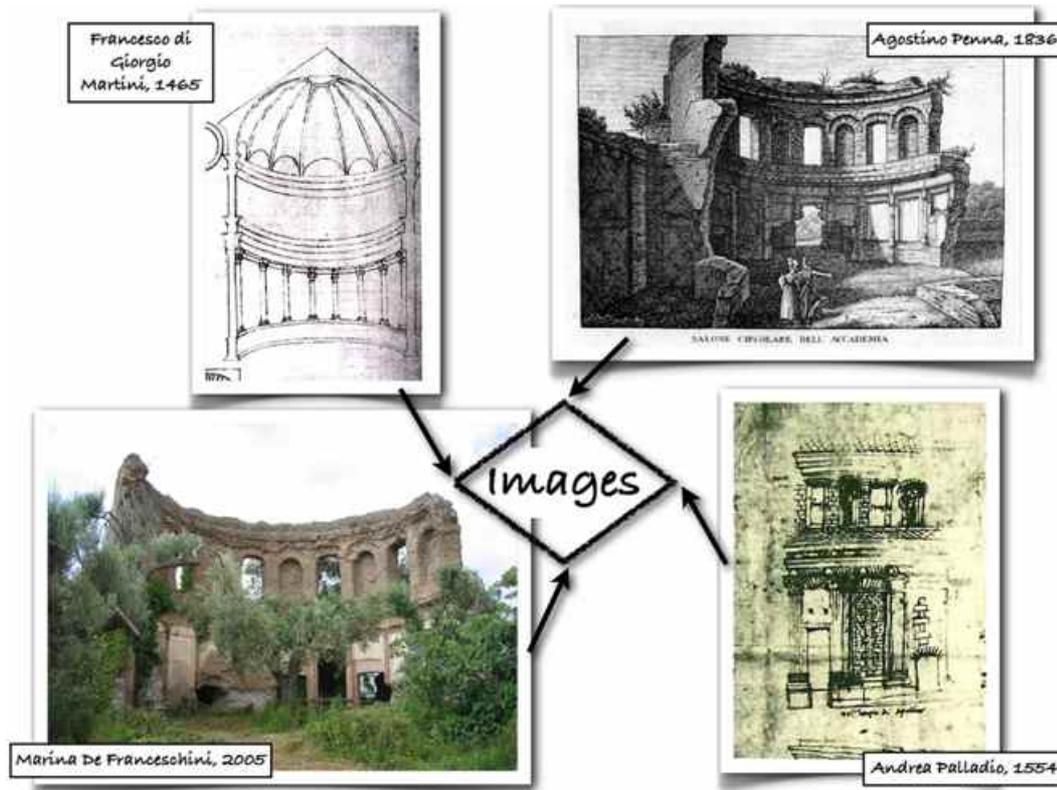
Fig. 5 – Images: drawings, engravings and pictures of the *Apollo's Temple* in the Accademia

Another example is the so-called *Apollo's Temple,* one the best preserved structures of the Accademia. We have drawings of the elevation and plans made by Renaissance architects: Francesco di Giorgio Martini, Andrea Palladio and Pirro Ligorio (fig. 5). Other plans of the Temple were drawn by Francesco Contini (in 1668), Giovan Battista Piranesi (in 1781), and Herman Winnefeld (in 1895). In 1991-1993 a survey was made by professor Friedrik Rakob with architects Faller, Helfgen and Krück and in 1990-1995 by the american architects Robert Mangurian and Mary-Ann Ray: they generously gave me access to their documentation and to a wealth of plans and pictures that also were inventoried and studied. To this we must add several hundreds of pictures and data coming from our survey, information about excavations, finds, sculptures, decoration and so on. How can we manage all this data?

GIS data-base

In my past books on roman villas I always worked with a catalogue entry system, which in a way was a paper data-base, with the inconvenience of the repetition of data when they were summarized in the final "general description". The problem can now be solved creating a GIS database with hypertext: information is stored just once and can be retrieved from different access points and/or different queries.

How can we organize our Gis data-base in an effective way, putting together information that is so varied and different? The starting point will be the single room, accessible through a number (AC1 or AC78) that will be shown in the general map, in the detailed plan, and in the 3D reconstruction. Starting from the number (or the room in the virtual visit) it will be possible to have access to all kind of data.
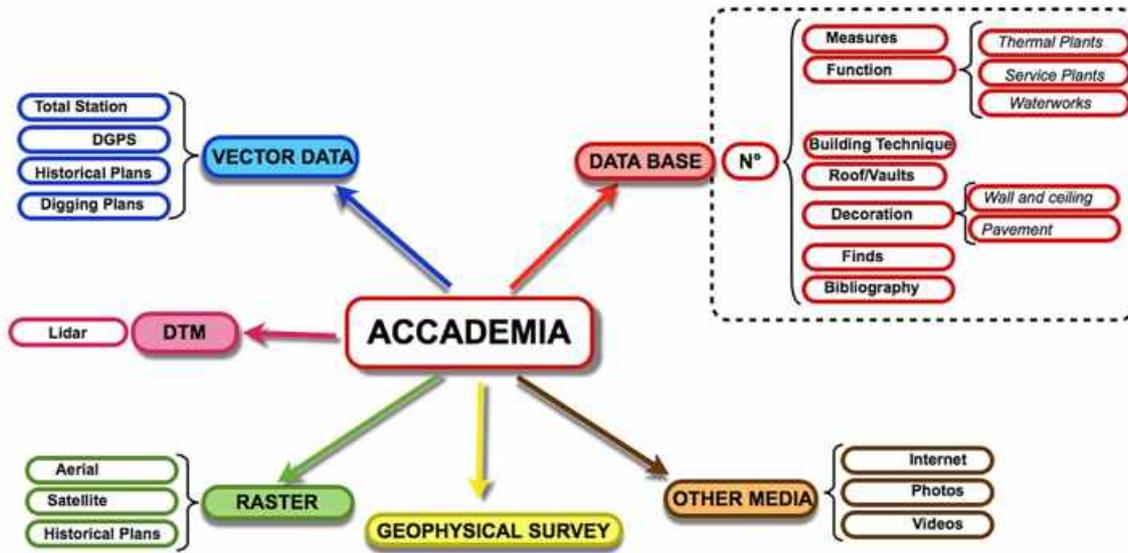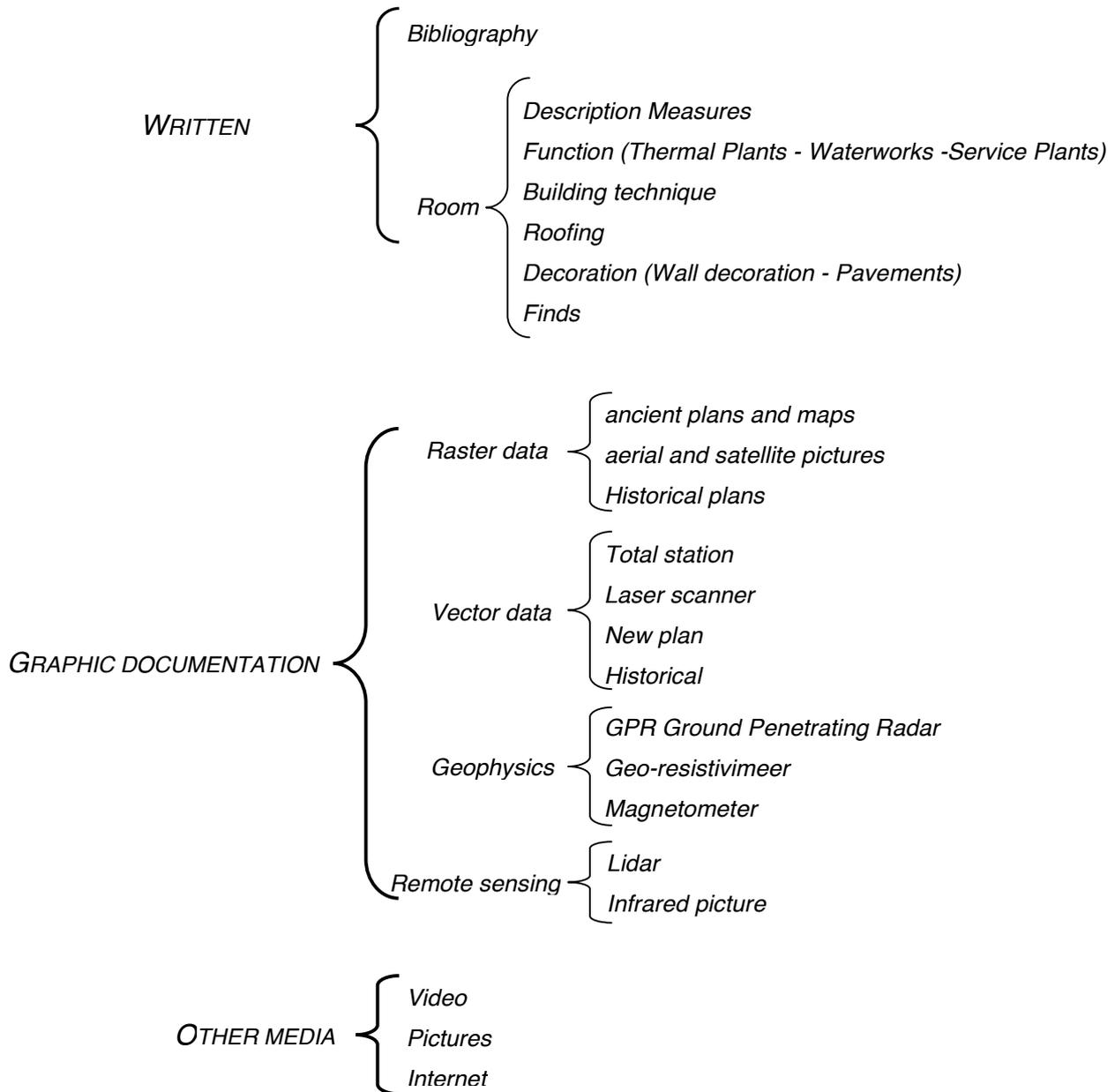
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Fig. 6 – General scheme of our GIS data-base (Copyright A.M. Marras)

The Gis data-base will have the following scheme (fig. 6):

WRITTEN

- Bibliography
- Room
  - Description Measures
  - Function (Thermal Plants - Waterworks -Service Plants)
  - Building technique
  - Roofing
  - Decoration (Wall decoration - Pavements)
  - Finds

GRAPHIC DOCUMENTATION

- Raster data
  - ancient plans and maps
  - aerial and satellite pictures
  - Historical plans
- Vector data
  - Total station
  - Laser scanner
  - New plan
  - Historical
- Geophysics
  - GPR Ground Penetrating Radar
  - Geo-resistivimeer
  - Magnetometer
- Remote sensing
  - Lidar
  - Infrared picture

OTHER MEDIA

- Video
- Pictures
- Internet

What will be the future of our documentation?

For the dissemination of the results of our research we have two options: *written* publication and *on-line* publication, which basically means *virtual* versus *real* data. Both have their good and bad sides.

Paper publication = "real" data.
It is important to point out that a medieval manuscript or a Renaissance book can still be read in a library, while the same book in a "Windows '98" format *cannot be opened any more* (fig. 7). A printed book will surely survive in the future, and its main advantages are the safeguard of intellectual property, the copyright guarantee and a free access in the Libraries.

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Notwithstanding information technology, the problem is that paper publications are still very expensive, especially as far as color pictures and plans are concerned, and there are limits in the number of pages. The best way to show details and give an accurate explanation is to have as many color pictures as possible (a short movie would be even better). A detailed index is also very important: it makes the book user-friendly, giving easy access to the information as it would be with a data-base.

We can suggest a sort of hybrid solution: a book including a CD or a DVD with all pictures and plans in color, and a data-base. But there is a very important question to ask: *for how long will these disks be readable*? How soon will CD's or DVD's become obsolete because something new has been invented and put on the market by software gurus?
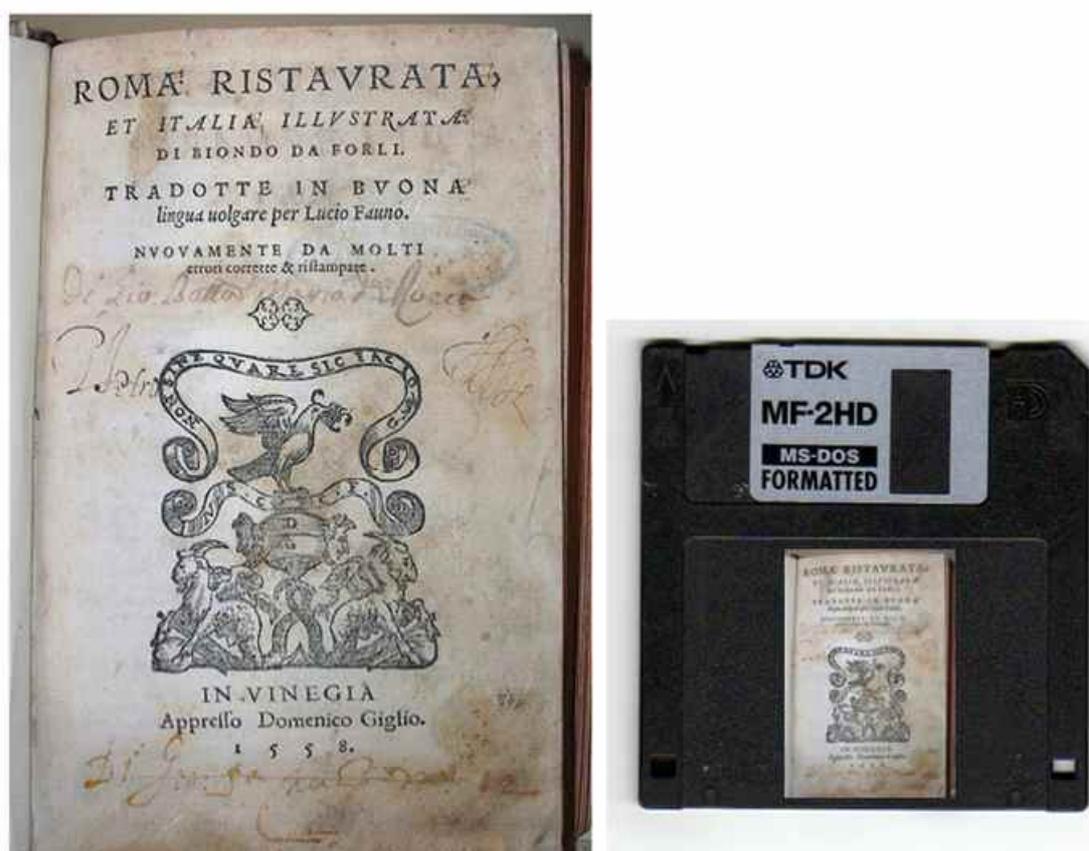

Fig. 7 – Final meditation: paper "*real*" documentation versus digital "*virtual*" documentation.

On-line publication = "virtual" data.

Other media, other problems. First of all, intellectual property is at risk. Several countries, including Italy, do not have laws against the theft of intellectual property on the internet (my website on Hadrian's Villa has been cloned twice, for example). If plans, pictures and text are published on the internet, it will be easy for other people to steal data and ideas. Nothing new under the sun: in the 1st century B.C. Vitruvius [50] wrote:

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[50] De Architectura, Book VII, preface 3: Loeb Classical Library, transated by F. Granger, 1970.

"We must censure those who plunder other men's works and appropriate them to themselves... Writers who do not depend upon their own ideas... but boast of other men's goods... should receive punishment for their impious manner of life".

The advantage of on-line publications is a wider audience, a wider dissemination of results, an unlimited number of pages, color pictures and plans. In a web-GIS data-base all information can be stored and updated continuously, with a quick and easy access. It is possible to navigate from a room pavement to the picture of it, and then to the statue that was found in the same room, to the related bibliography and further on.

To avoid the theft of intellectual property the best way is to select and limit access to on-line data. A general abstract of the study and its results can be published on the homepage of the website, giving "access on request" to a wider set of information only after subscription and/or identification. It is also possible to ask a (small) fee for downloading the text, the pictures or the entire book.

Another very important question is the preservation of data on the web in the future. Giving for granted that virtual data will never die (but how sure can we be about it?), it is important to remember that a black-out, a virus, a hacker or some other kind of computer failure can easily cancel or put out of order all our "virtual" documentation. Some kind of backup copies must be provided also for the web.

To summarize the question, we are in a transition period between one system and the other, and we are not necessarily forced to choose between the two. Paper 'real' data and digital 'virtual' data will surely co-exist for a long time to come. Each one must be seen and used as an integration or a development of the other: in this way we can make the most of the advantages given by both systems and reduce their 'collateral damages'.

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