



## *Methodological approach to conservation*



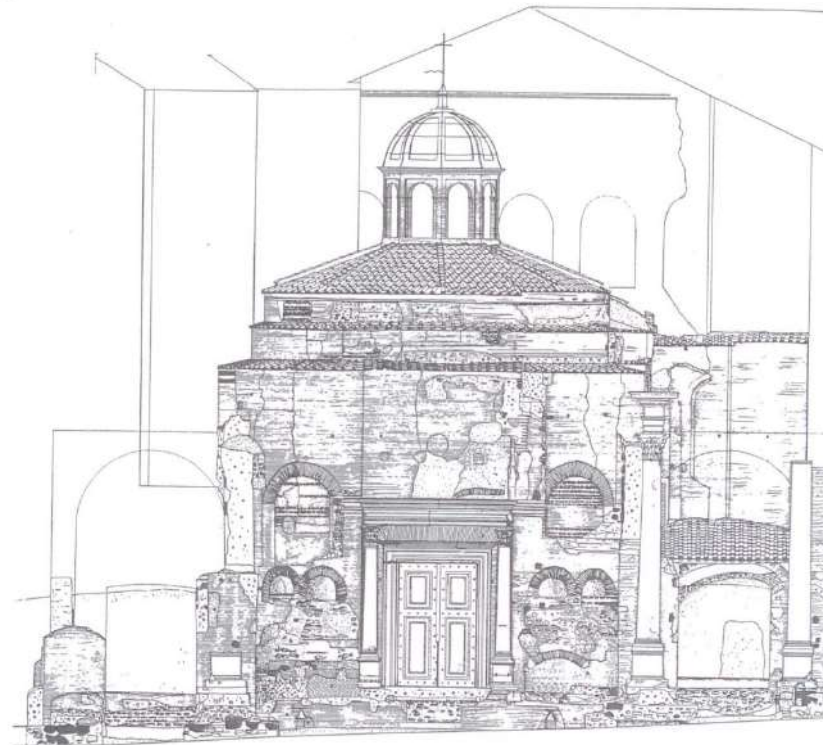
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# Methodological Approach to Conservation: Physical Approach

2 ECTS

SH

Sustainable Heritage



# Methodological Approach to Conservation: Physical Approach

1. Introduction to Methodological Approach
2. Geometrical Survey
3. Geometrical Survey: traditional method
4. Geometrical Survey: new tools
5. Material Survey.
6. Mechanical Survey.
7. Damage maps I: degradation problems
8. Degradation types.
9. Damage maps II: fissure and crack problems
10. Damage maps III: moisture problems
11. Damage tests on masonry constructions I
12. Damage tests on masonry constructions II
13. Survey, maps and tests on wooden construction
14. Archaeology
- 15. Stratigraphy**

# Methodological Approach to Conservation: Physical Approach



## LESSON 15. STRATIGRAPHY

# STRATIGRAPHY

## **A. STRATIGRAPHIC MAPS AND MATRIX OF HARRIS**

## B. PHASES /STAGES

## C. RELATION BETWEEN PHASES



## STRATIGRAPHY

### **Stratigraphy**

We begin by remembering and specifying the idea of stratus, as a region of a building. or associated with it, which enjoys a perceptive unity, extended to each and every one of its attributes, starting with the figure, to which colour and texture overlap; it is considered in principle indivisible; they also characterize its size, position with respect to a reference system; it is possible to detect spatial relationships: they link them to others and perhaps infer temporal ones.

A problem in the practice of the reading of walls is the reduction of the study to the visible walls of the walls, since in this way the tridimensionality of the architecture is ignored. A broader view should think of the stratigraphic units as elements with volume.

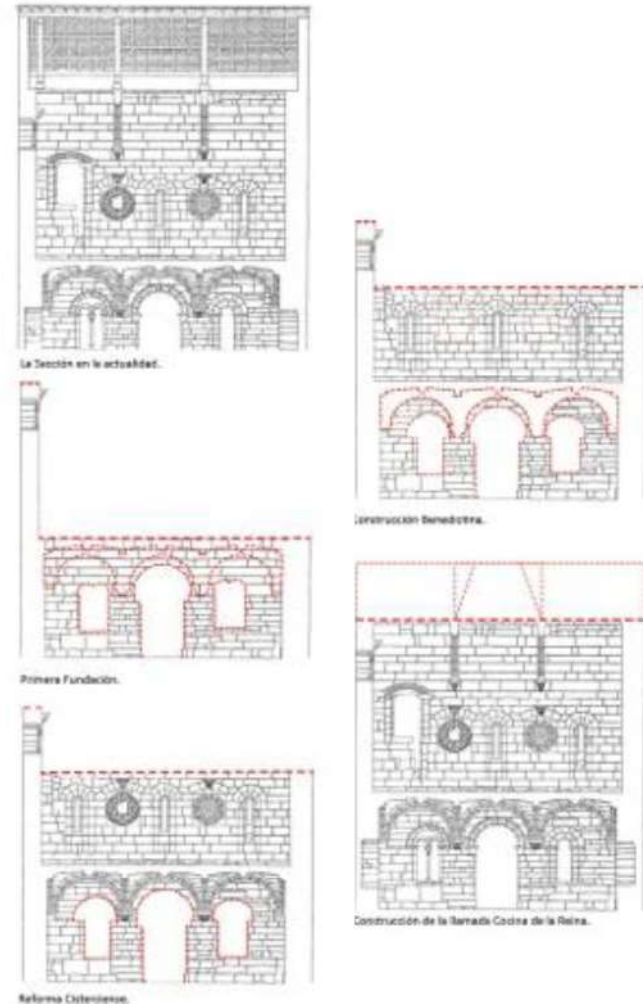


# STRATIGRAPHY

## Stratigraphy

The stratigraphic investigation applied systematically after a first graphical survey, comprehensive and reliable, helps, not always successfully, to distinguish, relate and, sometimes, date the different concurrent initiations, so that, in an optimal case, the Harris diagrams would describe the construction stages of the building.

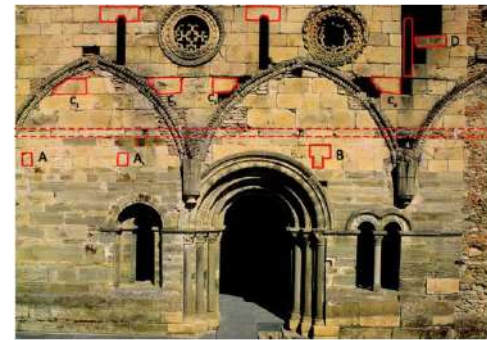
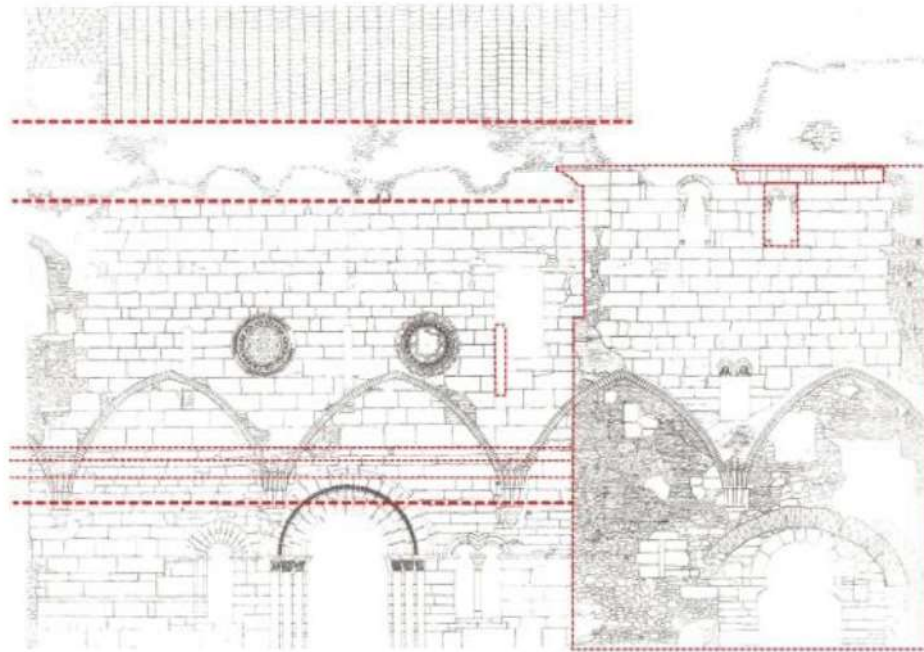
Supposition on the constructive process of one piece in the monastery of Santa María de Carracedo



## ARCHAEOLOGY

### Stratigraphic maps

The drawing of stratigraphic maps starts on a material survey. The aim is to distinguish different constructive or stratigraphic unit, this is, elements that are homogeneous in composition, construction, period of time, etc. Over the material survey there should be drawn the interphases or lines that separate one unit from the other.



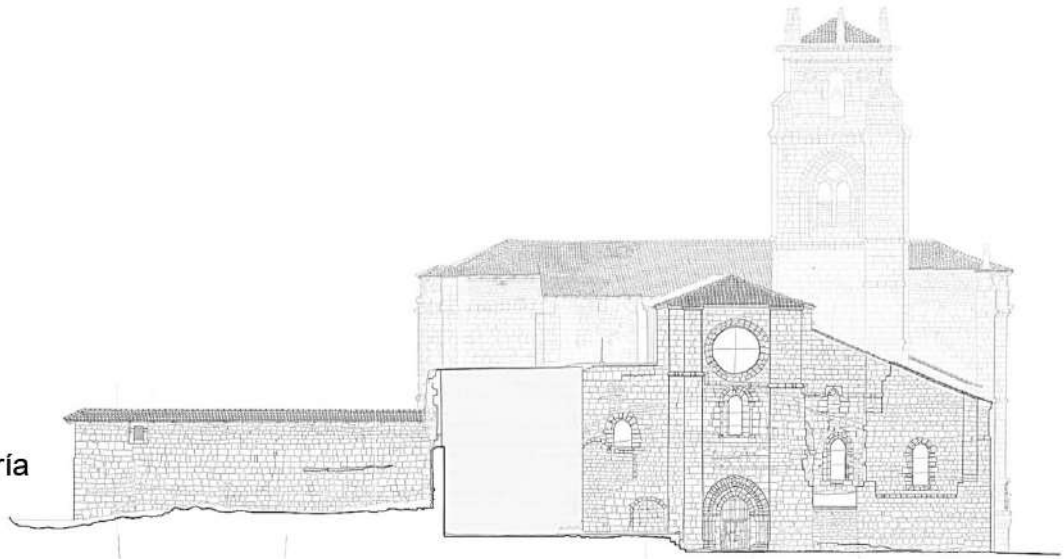
Stratigraphic analysis and ortophotography from the studies at Santa María de Carracedo monastery



# STRATIGRAPHY

## Stratigraphic maps

Material survey of Santa María la Real Church, Sasamón



Phase-delimitating lines on Santa María la Real Church, Sasamón

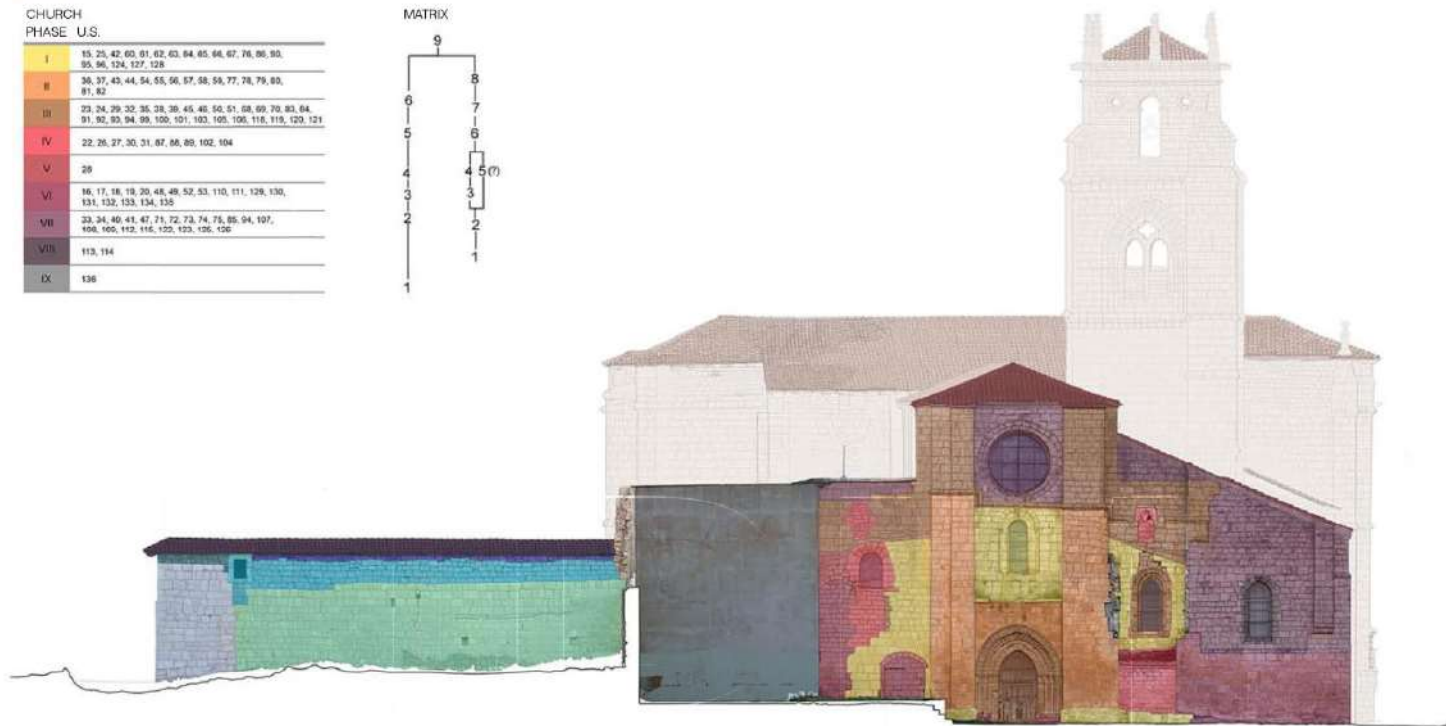
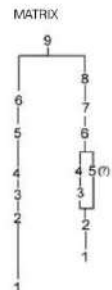


# STRATIGRAPHY

## Stratigraphic maps

CLOISTER	
PHASE	U.S.
I	1
II	5, 7, 8, 9, 12
III	3, 4, 6
IV	2
V	10
VI	11

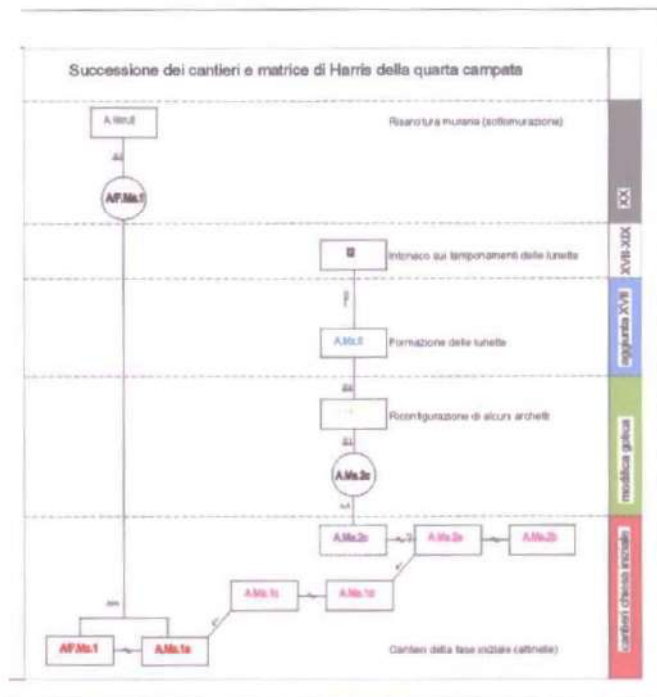
CHURCH	
PHASE	U.S.
I	15, 25, 42, 60, 81, 82, 84, 85, 86, 87, 76, 88, 90, 95, 96, 124, 127, 128
II	36, 37, 43, 44, 54, 55, 56, 57, 58, 59, 77, 78, 79, 80, 81, 82
III	23, 24, 29, 32, 35, 38, 39, 45, 46, 50, 51, 68, 69, 70, 83, 84, 91, 92, 93, 94, 99, 100, 101, 103, 105, 106, 110, 115, 119, 120, 121
IV	22, 26, 27, 30, 31, 87, 88, 89, 102, 104
V	28
VI	16, 17, 18, 19, 30, 48, 49, 52, 53, 110, 111, 129, 130, 131, 132, 133, 134, 135
VII	23, 34, 40, 41, 47, 71, 72, 73, 74, 75, 85, 94, 107, 108, 109, 112, 116, 122, 123, 125, 126
VIII	113, 114
IX	136



Stratigraphic map of Santa María la Real Church, Sasamón

# STRATIGRAPHY

## Stratigraphic maps



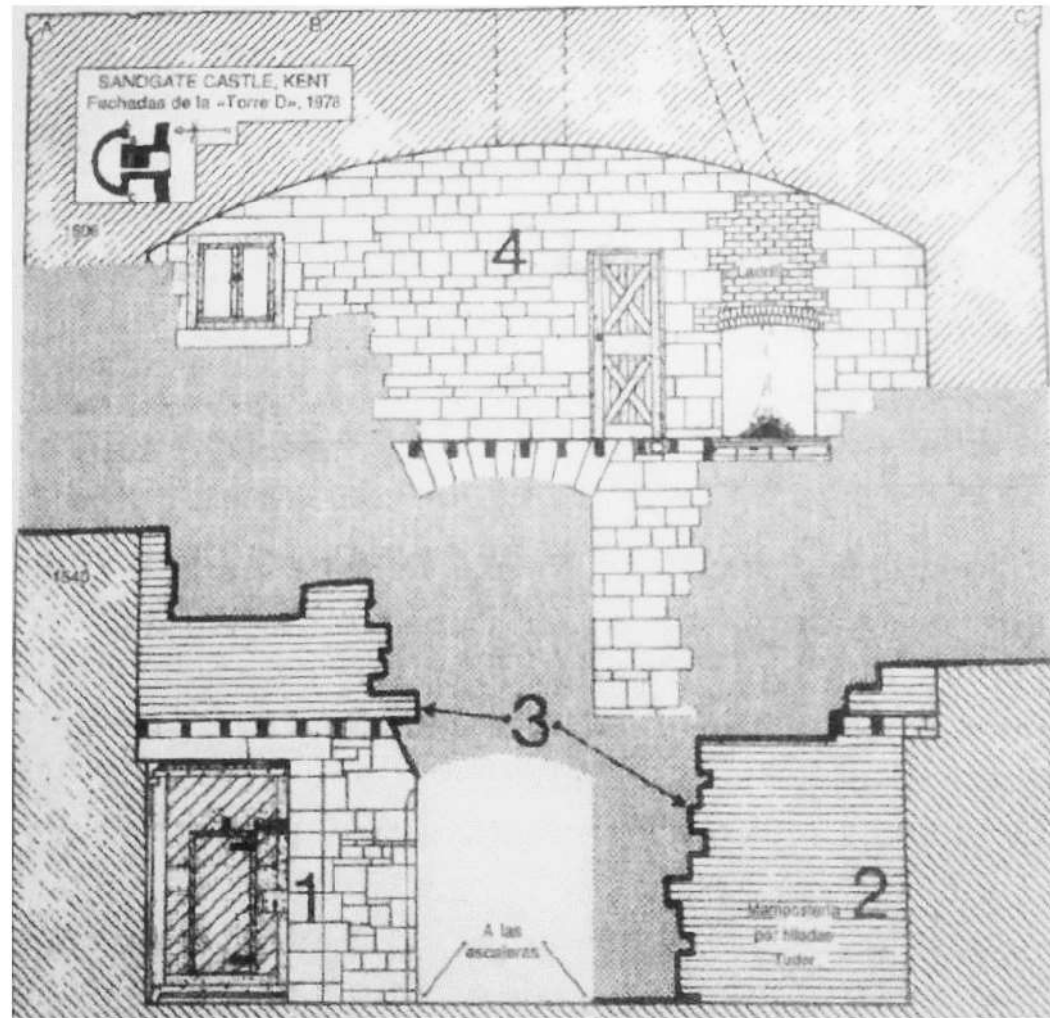
Matrix of Harris



Stratigraphic units map. By F. Doglioni.

## STRATIGRAPHY

### Stratigraphic maps



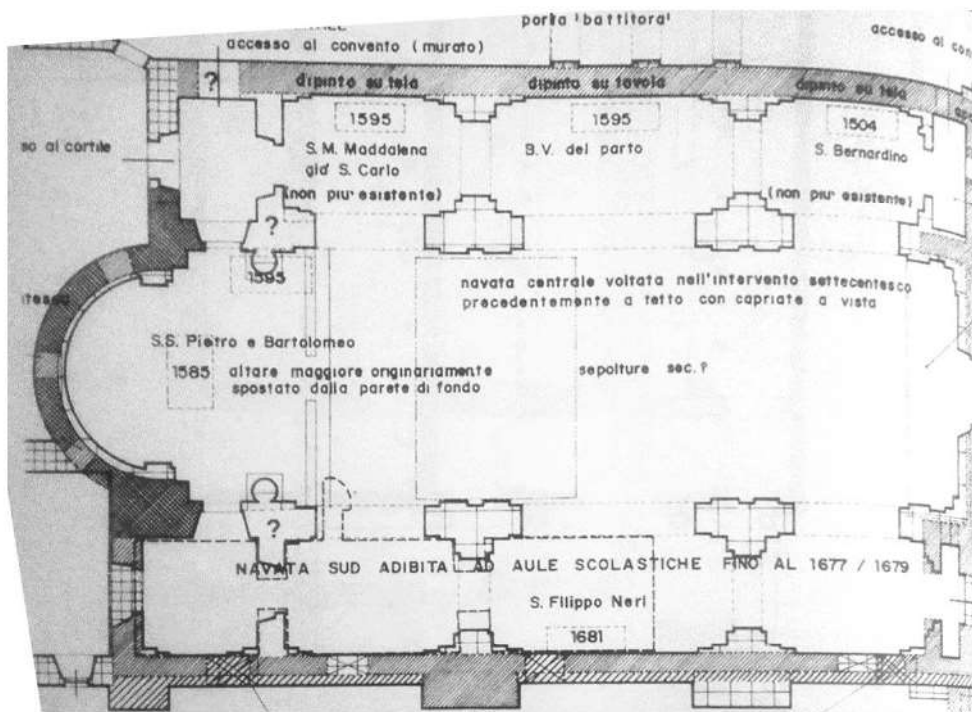
Example of a stratigraphic units map



## STRATIGRAPHY

### Stratigraphic maps

When a date is known with certainty,  
other units can be referred to that one.



- Spare/bare materials
- Before XII c.
- XII-XIII c.
- XIV-XV
- XVI c.
- XVII c. (Phase I)
- XVII c. (Phase 2)
- XVIII c.
- XIX c.
- XX c.

# STRATIGRAPHY

A. STRATIGRAPHIC MAPS AND MATRIX OF HARRIS

**B. PHASES /STAGES**

C. RELATION BETWEEN PHASES

## STRATIGRAPHY

### **Stratigraphic units or phases**

**1.Stratigraphic unit.** The stratigraphic element or stratigraphic unit is the smallest unit stratigraphically identifiable of those around it, equivalent to the geological stratum. It differs from the constructive unit in its stratigraphic and non-formal homogeneity.

There are two types of stratigraphic elements, those that they have volume and materiality, for which 'element' is specifically reserved, and those that only have a surface, which we call surface or interface.

**2.Interface.** They are each and every one of the figures that stand out for their perceptive autonomy at the border of a stratum. They have perceptual characteristics that individualize them and spatial relationships with the stratigraphic elements, especially with the one that sustains it, and also with other interfaces.

## STRATIGRAPHY

### Stratigraphic units or phases

There are *three classes of phases or regions*: **one massive**, genetically autistic, **another spatial**, muted by the loss of movable content and that only offers indications of relative chronology, and a **third superficial**, something more loquacious, because it provides information of the constitutive stage and also from later times.

- When we are analysing tectonic forms, that is, constructed, the **masses** remain equally mute, because we have forbidden the possibility of investigating their interior, since it would oblige them to destroy them, but they offer, like the spaces in the previous example, information about relative chronology;
- the **spaces** will give information that complements that of the masses, as corresponds to the dialectical relationship that links them;
- the **superficial phases**, will be the ones to provide more information: on the one hand, they will tell us about their own vicissitudes, all derived from the daily or occasional use of the spaces of which they are frontiers.



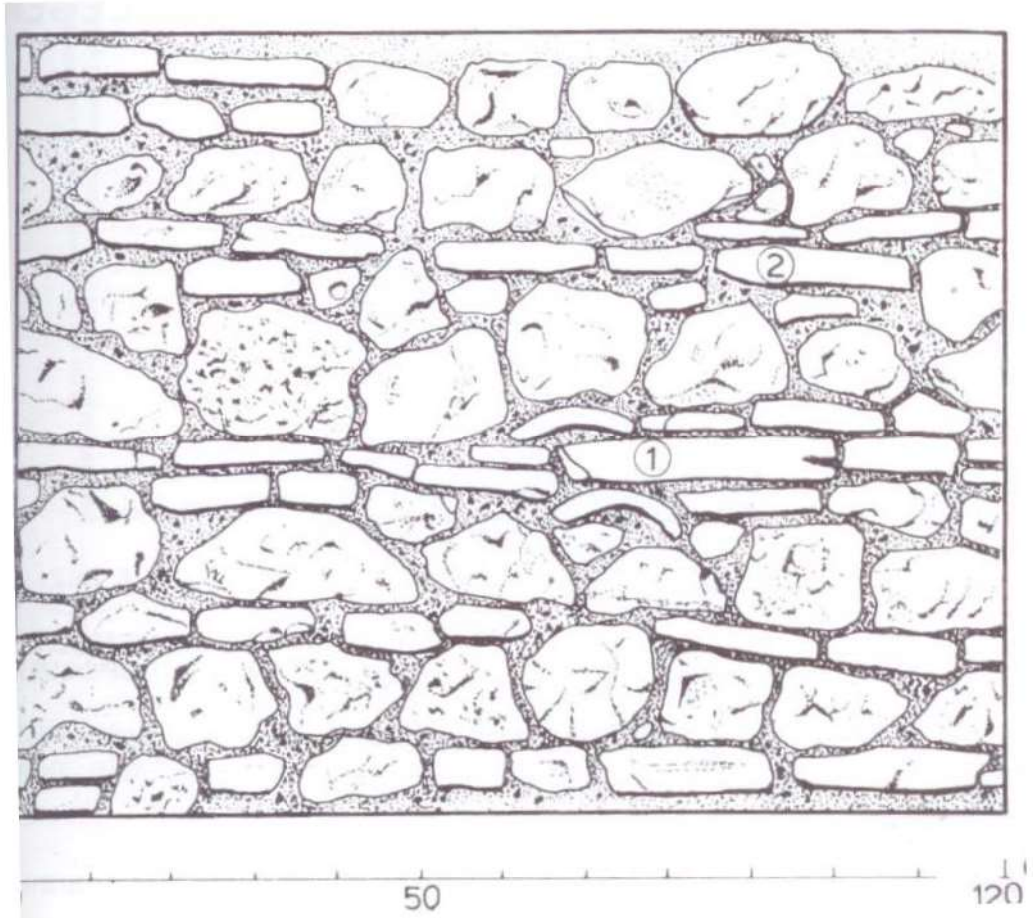
## STRATIGRAPHY

### Stratigraphic units or phases

1. **Material** The architectural masses appear constituted by simple and compound materials, in chemical sense, of organic origin, natural or artificial, that we denominate generically materials. In most cases, visual identification is sufficient; in others it may be necessary to characterize its composition.
2. **Format.** Some materials arrive at the work conformed, that is to say, constituting unit is typified in size and figure, while others must be it in the process of assembly or little
3. **Masonry.** The intrinsic characteristics and format of one or several materials offer a few specific ways of association. according to precise rules, thanks to which they constitute factories. These are supposed generic virtues of resistance and durability and are given a name, based on the main material or dominant format (latericia, ashlar, wall ...).
4. **Bonding.** The factories can be mounted on site according to different geometric patterns, chosen according to their meaning, formal appearance. performance, workability, stability or resistance, geometric ordering that we call rigging, because rigging consists in arranging formats of a factory in space ", to constitute the masses.
5. **(Constructive) elements.** The architectural masses, to form spaces, are articulated through elements of factories or specific factories. They are characterized by their constructive mission according to their structure, enclosure or installation, their techniques and means used and their formal appearance.
6. **Spaces.** The construction elements are associated, following the geometric guidelines of a regulatory layout, and according to their respective construction missions, to form groups that contain habitable spaces and that we call plants

## STRATIGRAPHY

### Stratigraphic units or phases



Example of a construction unit.  
By G. Carbonara.

# STRATIGRAPHY

A. STRATIGRAPHIC MAPS AND MATRIX OF HARRIS

B. PHASES /STAGES

**C. RELATION BETWEEN PHASES**

## STRATIGRAPHY

### Relation between stratigraphic units

The analysis of the stratigraphic / constructive relationships is undoubtedly the most delicate part of the process. In it three different readings are mixed: that of the spatial situation of the elements-in contact or not, above, below, to the alphas-that is paired with the constructive action that created them -cover, fill, support, attach, cut , join, etc. - that concludes with a temporal sequence of contemporaneity or of antero / posteriority. As you can see, the constrictive actions can be of many types, although to facilitate the analysis they are reduced to half a dozen; while the possible temporary relationships are only two.





## STRATIGRAPHY

### Relation between stratigraphic units

The experts offer definitions of what the columns mean and the relationships that link them to the ranks. R. Parenti mentions two relations of contemporaneity ("equal to" and "unites"), four relations of anteriority ("it is supported", "covered by", "cut by" and "filled by") and its inverse of posteriority; C. Mileto uses almost the same words to designate two of contemporaneity ("equal to" and "is linked to"), four of anterioridad ("supports-" covers "," cuts "and" fills in ") and their inverses of later, while Caballero summarizes his list in the following table.

	JOIN	SUPPORT	ATTACH	COVER	CUT	FILL
Previous to		X	X	X	X	X
Contemporary to	X					
Posterior to		X	X	X	X	X

Temporal relationships transformation table

# STRATIGRAPHY

## Relation between stratigraphic units

1. Relations of contemporaneity whose casuistry is quite captious.

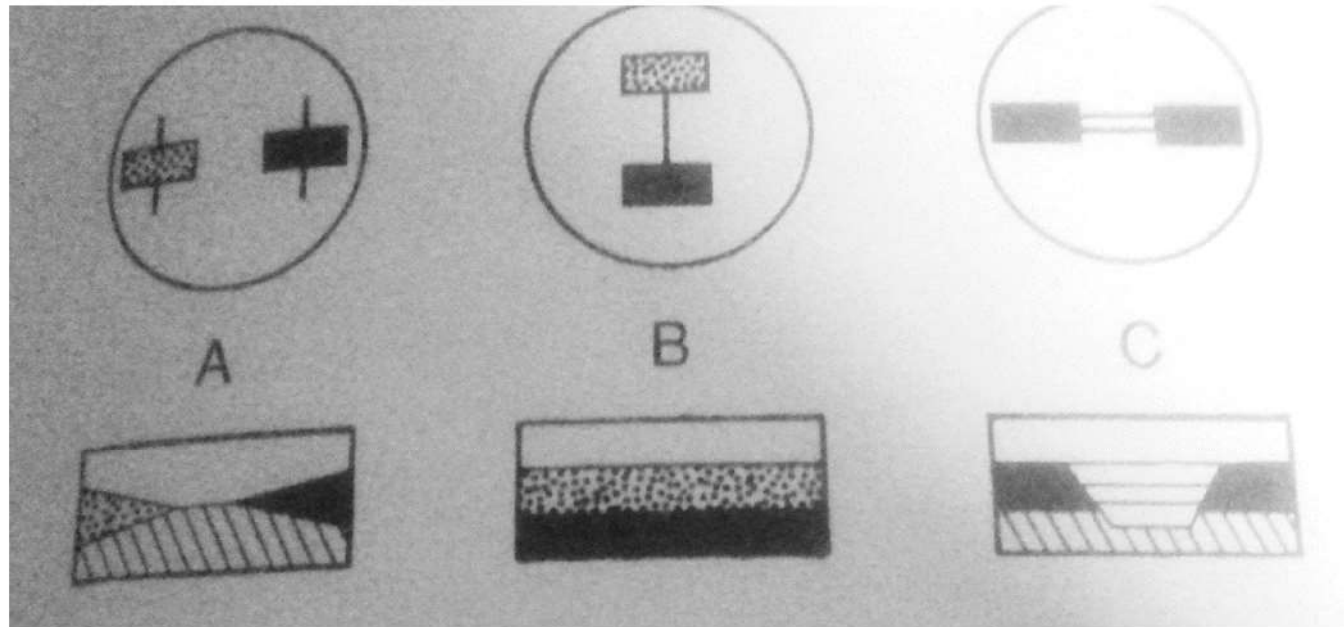
- "Equal to", which is a consequence of admitting that we have exceeded our suspicion by identifying elements or interfaces because other constructive elements concealed continuity or because we did not detect that the elements were "matched" (linked) by a missing section, which we now identify as a virtual element.

- "Joins to", which the author reserves for the corners of walls and is based on interpreting that the correct locking of formats and a unitary rig does not convert the jog in an interface, but only in an angle of those that form the lines of the regulatory path.



## STRATIGRAPHY

### Relation between stratigraphic units



Relations between units of archeological stratification:

- A) Units without direct stratigraphic connection.
- B) Superposed units.
- C) Interrelated units as parts separated from the whole.

## STRATIGRAPHY

### **Relation between stratigraphic units**

- It leans on / is supported, "is when you notice differences in materials and matching equipment in a continuous surface, an interface, shall be a line followed in the face, as clarifies My name does not matter that the support is According to an interface vertical or horizontal, but to Gentleman such gravitational distinction is the one that authorizes to him to label like "attach" the vertical case and "to support" to the horizontal.
- "Covers / is covered by", is a relationship similar to the previous one, but reserved for relations between a wall and its coverings; It is therefore a purely dimensional nuance: one element has "two dimensions and peak" and the other three.
- "Cut to / is cut by", based on the interpretation of the surfaces of the elements as cut interfaces (thanks mainly to the fragmentary shape of formats), it is understood that an element or interface has been cut. To this relationship Parenti devotes more attention than any other, although it is perceptually the least ambiguous.
- "Fill in / is filled by", relationship observed. "when it is built inside an interface or surface itself, whether it is an opening (the windows, a door), or a removal of material", which is the previous case.

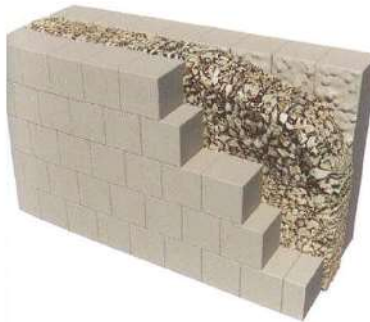


# STRATIGRAPHY

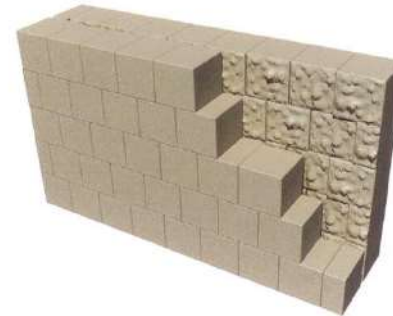
## Relation between stratigraphic units



Support relation



Two faces ashlar stone masonry wall with internal filler



Two faces ashlar stone masonry wall without internal filler



Complete attachment relation



Partial attachment relation



Two faces stonework masonry wall with internal filler



Two faces wall (one on stonework masonry and another on ashlar stone masonry) with internal filler

# STRATIGRAPHY

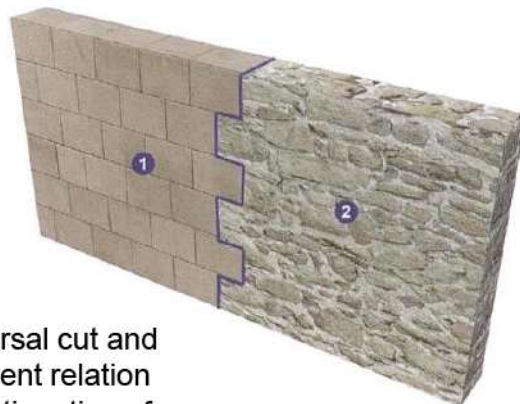
## Relation between stratigraphic units



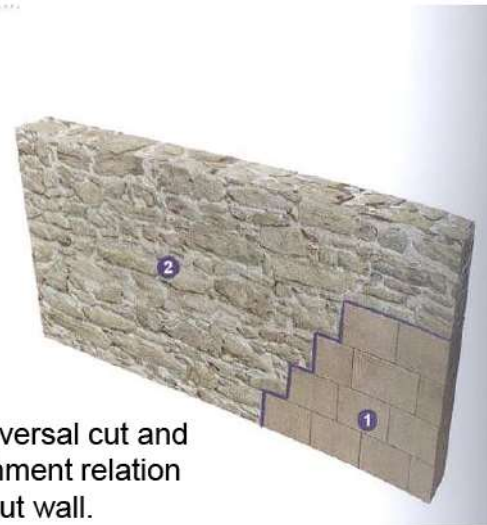
Longitudinal cut and attachment relation



Transversal cut and attachment relation



Transversal cut and attachment relation with continuation of work.



Transversal cut and attachment relation with cut wall.



## EXERCISE 02: STRATIGRAPHY

### INSTRUCTIONS

- a) Conduct a stratigraphy study on a monument, given the suggestion of the Arabic Wall of Madrid. The study should include identification of the different phases or stratigraphic units of which it is composed. A different code and colour will be assigned to every identified unit. There must be a card for each unit offering the technical data that allow to identify the constructive system and every card accompanied by a drawing or picture.
- b) Study the existing relations between the detected stratigraphic units: superposition, adjacency, addition, subtraction, etc. Represent these relationships in a Harris matrix.
- c) Make a Damages Map of the façade, indicating the mechanical, physical and chemical harms that can be identified.





ESTUDIOS / STUDIES

**Stratigraphic analysis of elevations and "inductive metrology":  
 an integrated approach in the study of the archaeological complex  
 of St. Mary's church in the Veliki Brijun island - Croatia  
 (from 5th to 11th centuries)\***

*Lectura estratigráfica de los alzados y "metrología inductiva":  
 un enfoque integrado en el estudio del complejo arqueológico de la iglesia  
 de Santa María en la isla Veliki Brijun - Croacia (siglos V-XI)*

Serena Zanetto<sup>1</sup>  
 Independent researcher

**ABSTRACT**

This paper aims to demonstrate the potentiality of an integrated approach in the study of architecture, which combines archaeological analysis of elevations and calculation of the units of measurement employed to trace the plans. The complex of St. Mary's Church, on the Veliki Brijun Island, represents a particularly interesting case study to which one can apply to this approach, because it is an architectural palimpsest characterized by a long stratigraphic sequence dated from the 4th to the 16th centuries. Most importantly, this method has confirmed the stratigraphic sequence and has contributed to better know the architectural phases, even though the architectural palimpsest is very complicated. Also, on the other hand, it has shed light on several aspects linked to the building sites and to the workforces.

**Key words:** measuring systems; analysis of elevations; Veliki Brijun; Late Antiquity; Early Middle Ages.

**RESUMEN**

El objetivo de este artículo es mostrar la potencialidad de un enfoque integrado en el estudio de arquitectura, que combina la lectura estratigráfica de los alzados con el cálculo de las unidades de medida utilizadas para trazar los planos. El complejo de Santa María, en la isla de Brijuni Mayor, es un caso de estudio particularmente interesante para la aplicación de este enfoque, ya que es un palimpsesto arquitectónico caracterizado por una amplia secuencia estratigráfica comprendida entre el siglo IV y el siglo XVI. Por un lado, este método confirma la secuencia estratigráfica y ayuda a comprender mejor las fases de construcción; por otro, arroja luz sobre aspectos relacionados con el sitio de construcción y los trabajadores.

**Palabras clave:** sistemas de medida; análisis de los alzados; Veliki Brijun; Antigüedad tardía; Alta Edad Media.

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\* This paper is partially the result of a research carried out during my PhD: in History, Criticism and Conservation of Cultural Heritage at the University of Padua (Italy), discussed in 2016 and under the supervision of G. P. Brogolo. The thesis' title is "Tecniche costruttive, ciclo edile e spostamenti di maestranze nel Medio-Alto Adriatico, nel sec. VIII-XI. L'alto medioevo visto attraverso le chiese" ("Construction techniques, building cycle and transfer of skilled workers in the Upper-Middle Adriatic Sea, during the VII-XI centuries. The Early Middle Ages as seen through churches").

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