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Chronological study of the chapel Saint-Jean-Baptiste de la Cité in Périgueux, France: contribution of mortar luminescence dating to building archaeology

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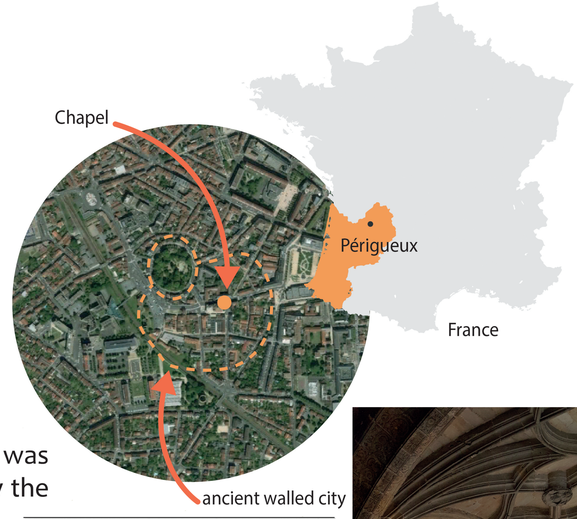


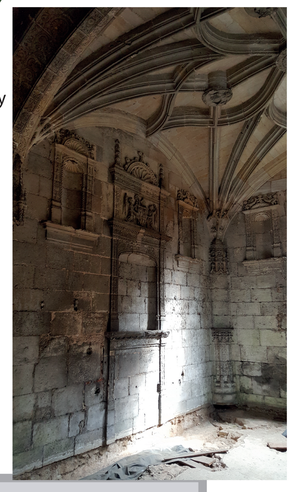
The Saint-Jean-Baptiste chapel is located in the city of Périgueux (France), in the gallo-Roman urban area that was fortified during the 4th century. The chapel belonged to a late middle ages espiscopal complex dominated by the Saint-Etienne church which represented until 1669 the ancient cathedral of Périgueux.

Seven building states have been identified from the gallo-Roman Antiquity until the present day

the objective of this study is to refine the chronology of the site. the excavations highlighted a complex stratigraphy where all stratigraphic links could not be ensured

i) An excavation space constrained at the surface of 31m²
ii) A dense stratigraphy with only 60cm between the Gallo-Roman levels and the current floor

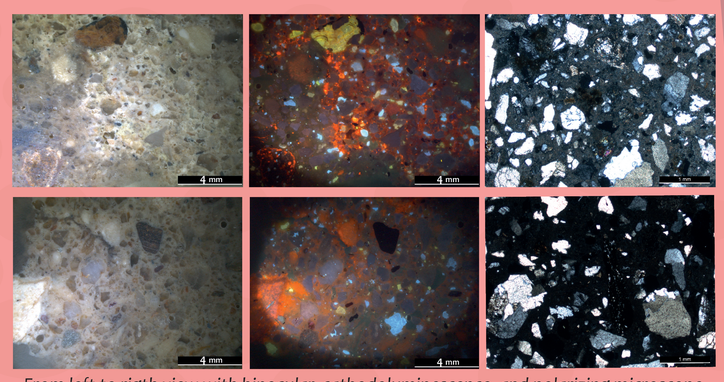
the chapel is known for its rare renaissance style



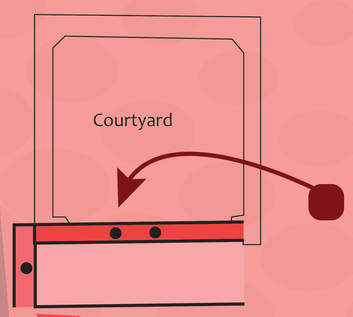
State 1 - A gallo-Roman building

3 samples of this state have been dated by SG-OSL

2 lime mortars of the building have been dated
SG-OSL dating : 160-400 and 440-660A.D



From left to rigth view with binocular, cathodoluminescence, and polarizing microscope



The chronological sequence is the result of all analyses using *chronomodel* © software with 95% of confidence interval[3] .

The northern wall of the nave was at first glance interpreted as a medieval wall.

But all the analyses link the masonry to the gallo-Roman building:

i) SG-OSL dating: 55-255 A.D

ii) The mortars from the gallo-roman masonry and from the northern wall have similar paterns

This gallo-Roman masonry is reused in all successive construction until today

Imitation of Antoninien of Tétricus (274-294 AD.)

coins were found in layers of the courtyard

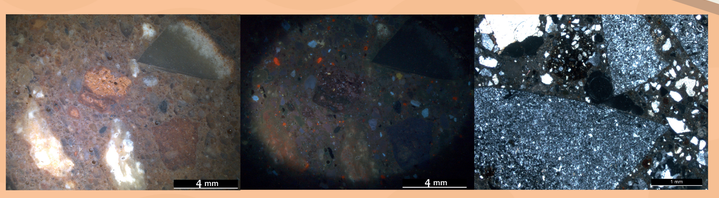
The SG-OSL dating of the sediment of this layer is **205-405 A.D**

This is the interface between the states 1 & 2

State 2 - A paleochristian espicopal complex?

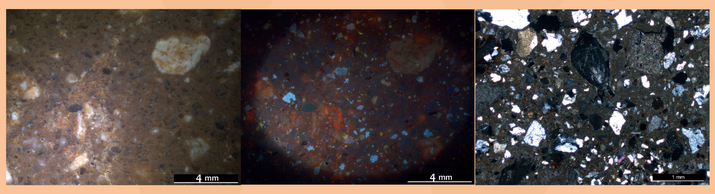
A polygonal apse building associated with cocciopesto floor (lime mortar with fragments of bricks/terracota)

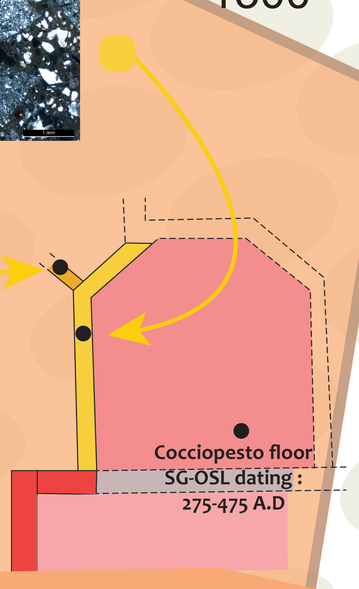
SG-OSL dating: 260-490 A.D



Then in a second time, another masonry is built in the north est of the polygonal apse

SG-OSL dating : 135-440 A.D





The lime mortars of the two masonries are quite unique on the site.

We can assume a construction close in time, maybe of a larger complex in the fortified city, as a primitive episcopal group ?

Methods

A total of 29 mortar samples have been charaterized. **10 mortars and 2 sediments,** considered the most representative, were **dated by OSL.**

Characterization

- Petrography on thin section
- Laser granulometry of aggregate
- Elemental analysis and mapping by SEM-EDS
- Beta autoradiography
- Cathodoluminescence imaging

Dating lime mortars by optically stimulated luminescence (OSL)

The basic principle of OSL mortar dating consists in **dating the last exposure of mortar aggregate to light** corresponding to the moment of **mortar making wich directly precedes the erection of the masonry.**

BNF, Français 296, fol. 146, Reconstruction des murs de Jérusalem

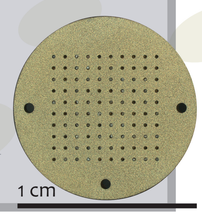
Dating of mortar by optically stimulated luminescence with so-called **«single grain technique» (SG-OSL) using EED model** is a novel approach that slowly begins to penetrate into archaeological research [1&2].

All SG-OSL dates are presented with a 68% confidence interval.

Annual dose:

High resolution low background gamma spectrometry, Al2O3 field dosimetry and NaI:Tl field gammametry ; complementary measurements of U and Th of quartz grains by ICP-MS.

Single grain disc, 100 grains can be analysed in 1 disc. Generally more than 2000 grains are analysed for each sample



State 3 & 4 - only one medieval chapel?

The square chevet of a medieval espiscopal chapel

A lime plaster - **SG-OSL dating: 1040-1190 A.D**

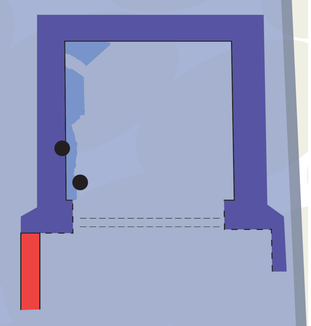
the lime mortar in the masonry could not be sampled for a conservation concern

A foundation masonry - **SG-OSL dating: 575-755 A.D**

2 hypothesis :

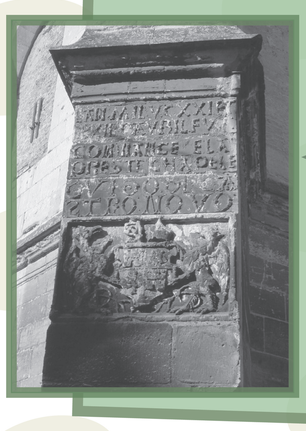
i) The reconstruction of a new choir on an early medieval building during the central middle ages

ii) A repointing of the choir during the central middle ages



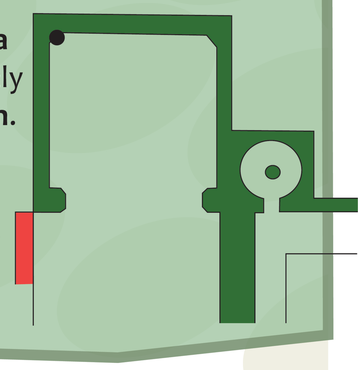
Use of the medieval chapel

State 5 - 1521, The renaissance chapel



The actual choir rebuilt in a renaissance style is precisely **dated 1521 by an inscription.** A this moment, a second chapel is built above the chapel Saint-Jean-Baptiste.

SG-OSL dating : 1410-1500 A.D



The study of the Saint-Jean-Baptiste chapel an insight into organisation and evolution of the Périgueux city throughout its history. Only new excavations around the site would make it possible to verify, or not, the establishement of an episcopal complex in the early Middle Ages.

[1] URBANOVÁ P. & GUIBERT P., 2017 = A methodological study on single grain OSL dating of mortars : comparison of five reference archaeological sites, « Geochronometria », 44, pp. 77-97.
[2] GUIBERT et al. 2017 = GUIBERT P., CHRISTOPHE C., URBANOVÁ P., GUERIN G., BLAIN S., Modeling incomplete and heterogeneous bleaching of mobile grains partially exposed to the light: Towards a new tool for single grain OSL dating of poorly bleached mortars, « Radiation Measurements », 107, pp.48-57.
[3] LANOS P. & PHILIPPE A., 2017 = Hierarchical Bayesian modeling for combining Dates in archaeological context, « Journal de la SFdS », v. 158 (2), pp 72-88.

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