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The woods of Orange's ancient theater

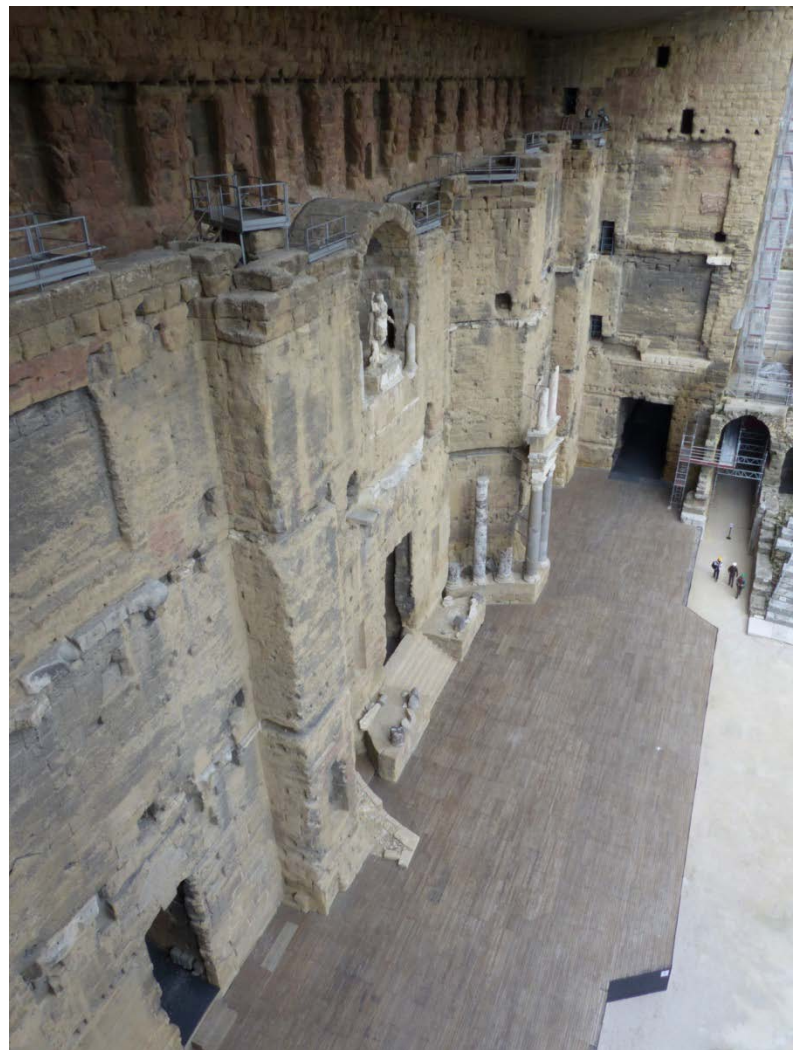
Shindo Lisa^{1,2}, Borel-Dubourg Sandrine³, Cenzon-Salvayre Carine⁴, Badie Alain³

1 = Service d'archéologie de Nice Côte d'Azur, France.

2 = Aix Marseille Univ, CNRS, CCJ, Aix-en-Provence, France.

3 = CNRS, Aix Marseille Univ, Institut de Recherche sur l'Architecture Antique, Aix-en-Provence, France.

4 = Aix Marseille Univ, CNRS, LA3M, Aix-en-Provence, France.



Stage wall with and without scaffolding (© IRAA)



PRESENTATION

This is the only ancient theatre in the West with such a **well-preserved stage building** (104 m long, 36 m high). It is a **UNESCO World Heritage Site**.

Since 2016, there has been a **new restoration campaign** spread over eight years. The installation of scaffolding allows access to areas that were previously inaccessible. This is an exceptional opportunity for architects and archaeologists to update knowledge of the theatre.

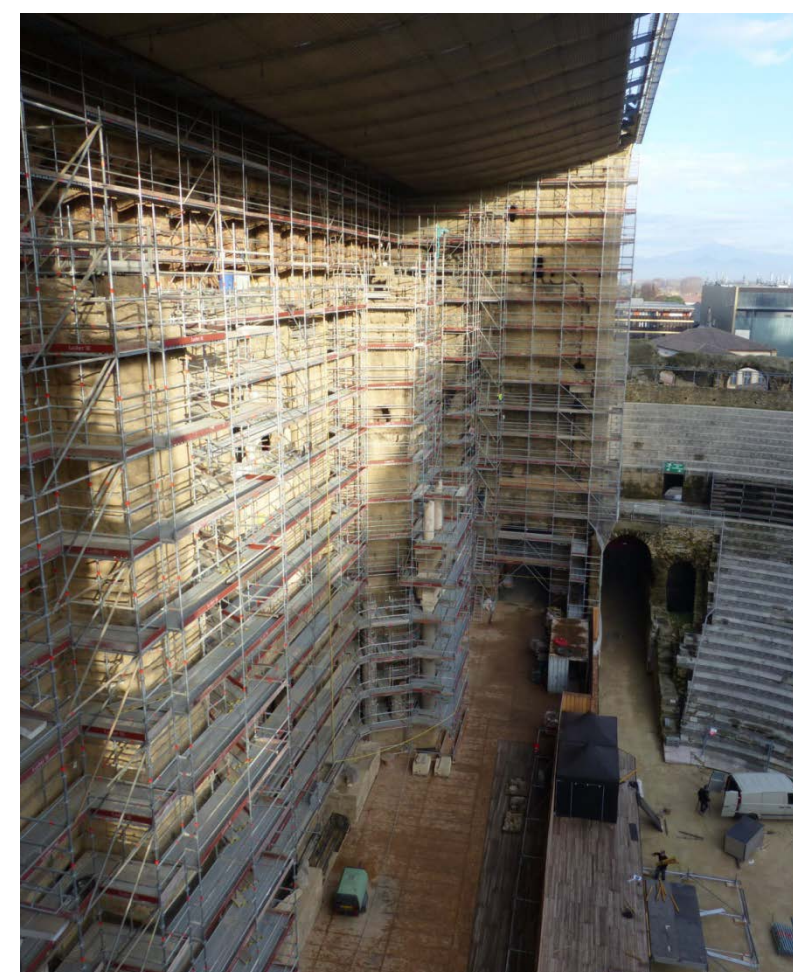
HISTORY OF THE BUILDING

The Roman colony of *Arausio* (Orange) was founded around 30 BC. Construction of the theatre began at the turn of our era, during the reign of Augustus. This building lost its function at an unknown date, probably after the end of the 3rd century. Subsequently, the theatre was used as a residential area, as well as a prison, which enabled its elevations to be preserved.

THE WOOD MATERIAL

Today, the dominant material is stone, but we know that the ancient building had several roofs with wooden frames (the stage roofs, with a 15 m overhang). After Antiquity, when the theatre was reoccupied, wood was used extensively for the constructions leaning against the ancient walls and for the internal fittings (staircases, floors, niches, door frames, formwork).

How can these wood remains can be studied and what information can be obtained?



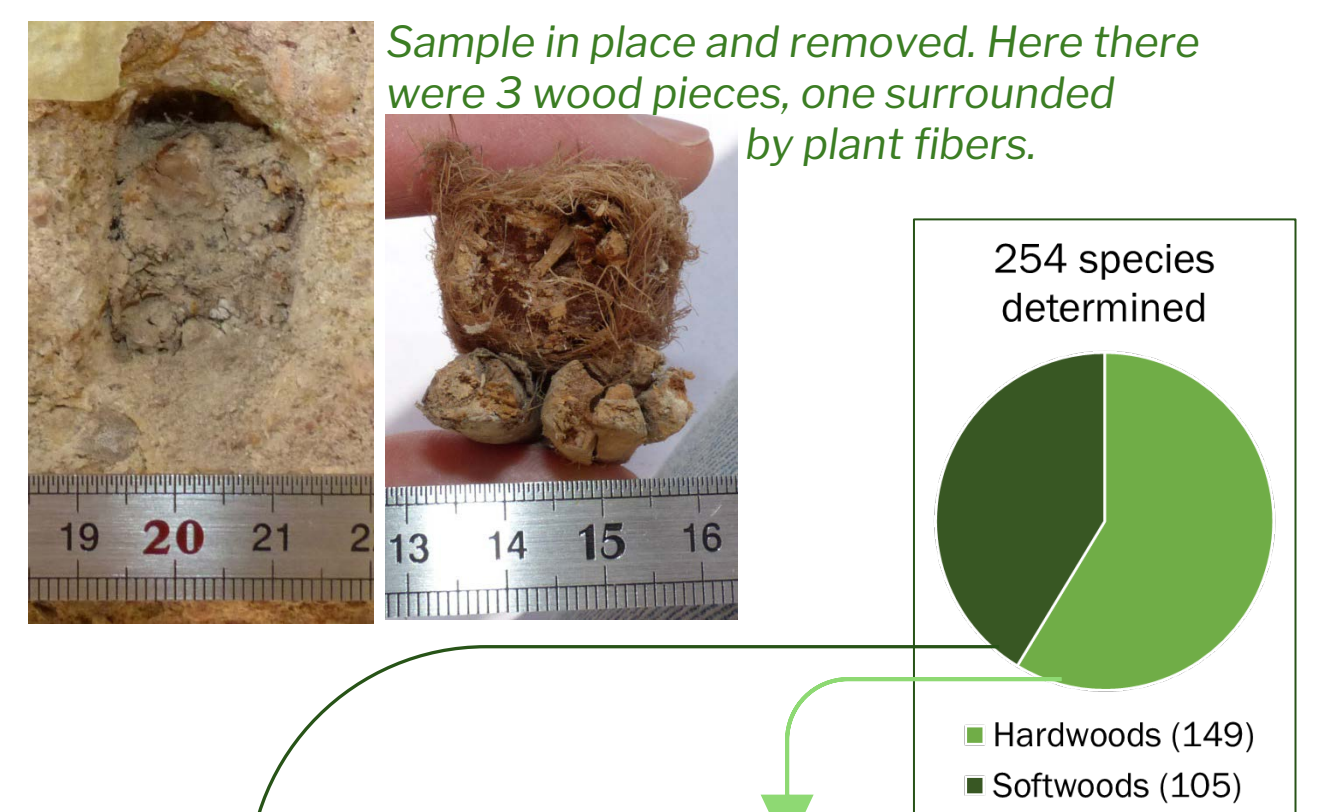
METHODS

Because of the **time constraints and co-activity** associated with the worksite, we implemented a methodology that enabled to recover **as much xylological data as possible in a limited time**.

Prior to our intervention, the architect-archaeologists located the **506 cavities with wood** during their 1:20 and 1:50 surveys.

The timbers were **photographed, measured** and, where possible, **extracted** from the walls using pointed tools.

In the laboratory, the **species were identified**. Thirty-six pieces of wood with sufficient tree rings were studied using **dendrochronology**; five samples were dated using the **radiocarbon method** (accelerator measurement, AMS).



FIRST RESULTS AND DISCUSSIONS

SPECIES

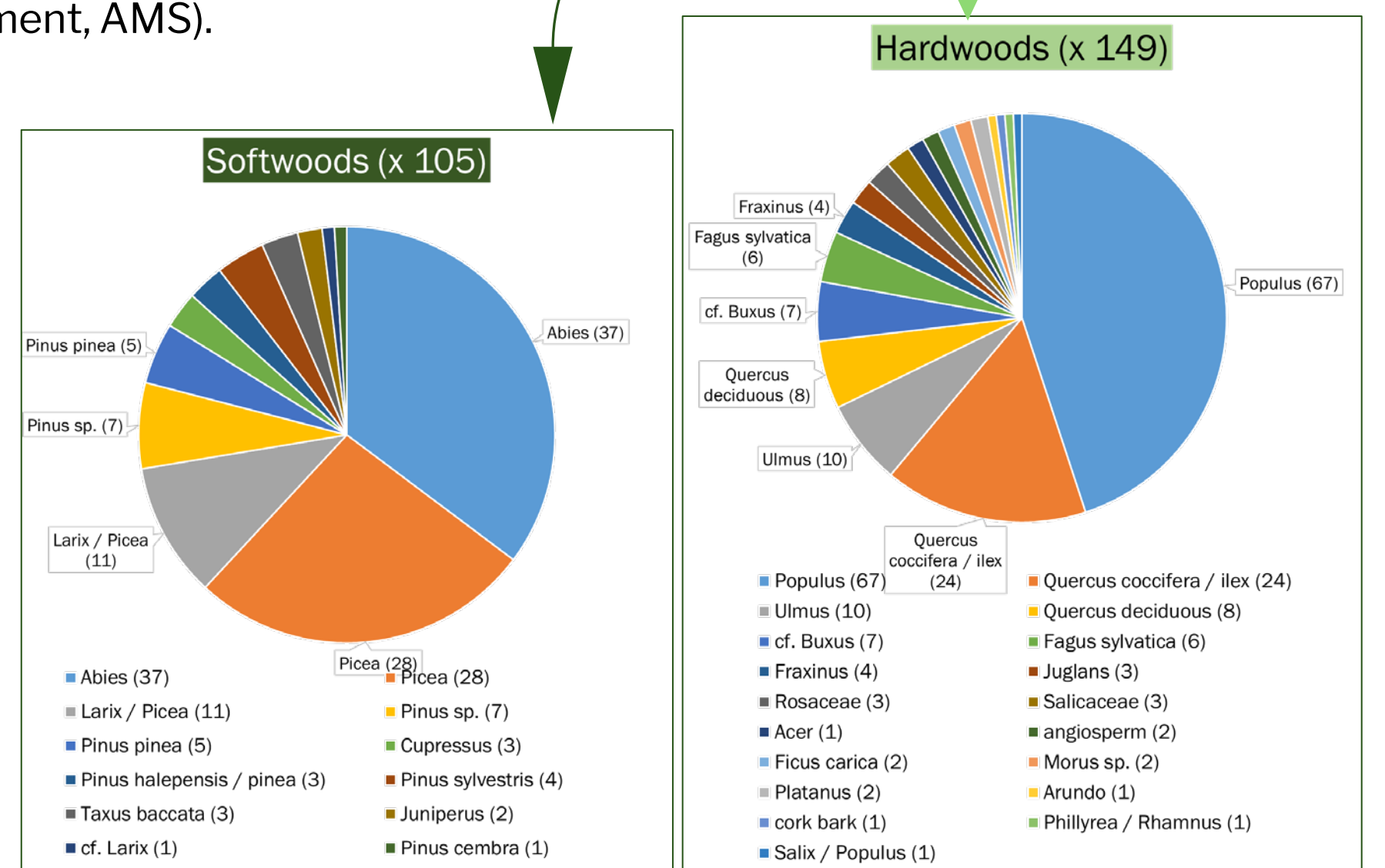
So far, 254 samples have been identified: 59% hardwoods, 41% softwoods (diagrams on the right). There are **30 different species** in all. We identified species rarely used in construction and joinery, such as *Ficus carica* (fig tree) and *Buxus* (yew). Some species are very local (*Quercus deciduous*, *Pinus halepensis*), while others grow at altitude and have necessarily been imported (*Larix*, *Pinus cembra*). However, to go any further with these interpretations, absolute dates are needed.

DENDROCHRONOLOGY

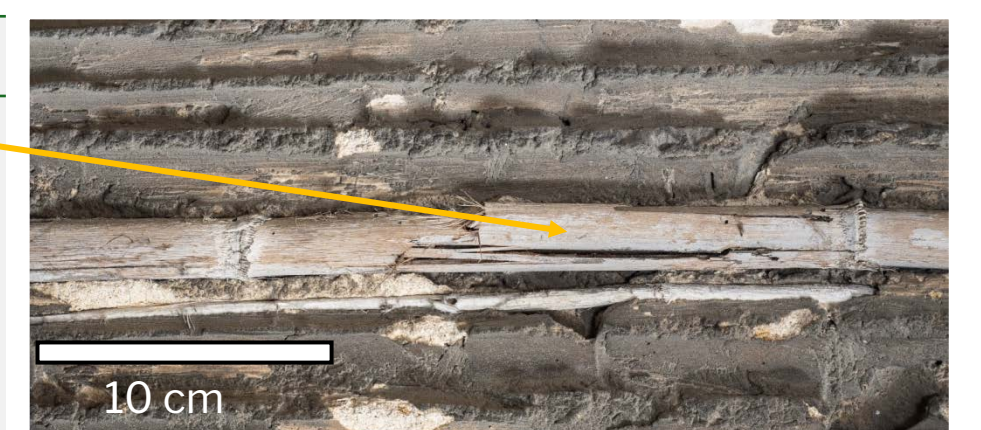
Of the 36 timbers studied by dendrochronology, most samples have between 2 and 66 rings and the species are very varied. One sample, *Larix/Picea*, has 180 rings and stands out from the rest. For the moment, none of the samples have been dendrochronologically dated.

RADIOCARBON DATING (results in the table on the right)

In the cells of the stage wall, two wood pieces have been dated to the **13th century**. One is a fragment of cane set into the plaster of a vault (see picture on the right), the other is a fragment of *Pinus* sp. plank. In both cases, these dates document a little-known period in the history of the theatre.



Code	Location	Species	¹⁴ C date, CAL AD (95.4%)
/	Room in the stage wall	<i>Arundo donax/phragmites</i>	1219 - 1280
251	East Aditus	<i>Pinus</i> sp.	1222 - 1282
65	Stage wall	<i>Quercus coccifera/ilex</i>	1495 - 1656
35	Stage wall	<i>Ficus carica</i>	1528 - 1662
52	Stage wall's east return	<i>Juglans</i>	1660 - 1954

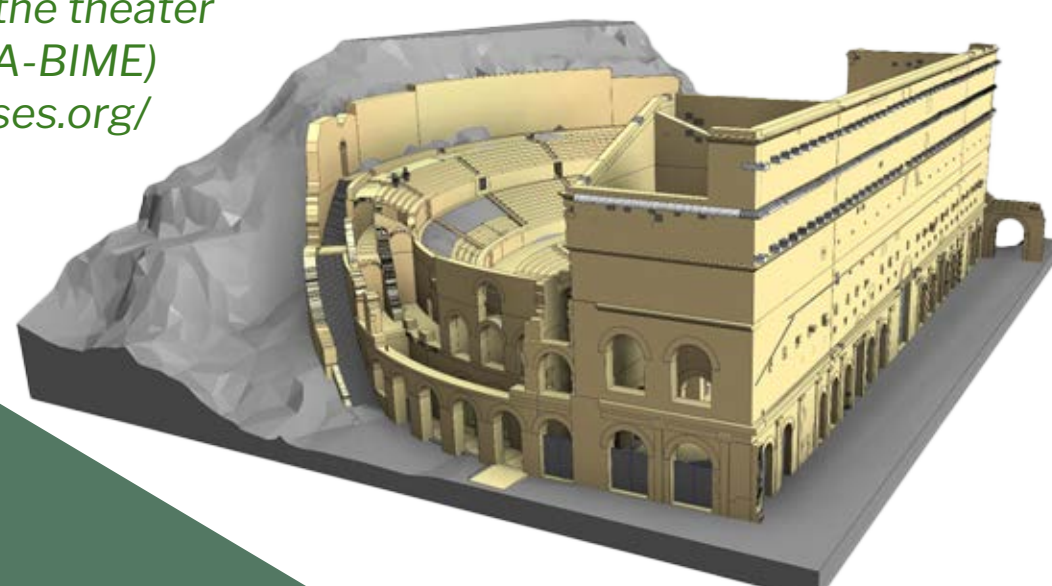


13th c. cane dated by ¹⁴C method (© L. Damelet, CNRS, CCJ)

RESEARCH OUTLOOK

The last species will soon be determined. This will enable to propose a **vertical map of the species** used and to understand their spatial distribution. We will also be subjecting new samples to radiocarbon dating. This may help us to understand the function of the timbers studied and, by extension, provide a **reconstruction of the wooden installations** in the theatre.

Digital model of the theater (© IRAA, A-BIME) <https://taic.hypotheses.org/>



Ultimately, it will be essential to integrate the results of the timber analyses into the theatre's **HBIM model** (Historic Building Information Modeling, TAIC2 project, A*Midex, see the model on the left), so that they can be **linked to all the other data** concerning the theatre. The challenge is multi-faceted: on the one hand, we need to establish a link between the **technical characteristics** of the timber elements (according to their species) and their **function** in the building, and on the other hand, we need to think on a regional scale to identify where the building materials are **sourced** and how they are **transported** to the theatre.

Contact
Lisa.shindo@nicecotedazur.org

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