WHAT IS ALABASTER?

The noble variety of gypsum:

- $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

or of anhydrite:

- $\text{CaSO}_4$

With a little bit of strontium:

- $\text{Ca}_n(\text{Sr}_{1-n})\text{SO}_4 \cdot 2\text{H}_2\text{O}$
- $\text{Ca}_n(\text{Sr}_{1-n})\text{SO}_4$
**THE ISOTOPE TOOLBOX**

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**Routine analyses at BRGM**

- *B*
- *C*

**Compound specific isotope analysis**

- *B*
- *C*
- *N*
- *O*
- *F*
- *Ne*

Under development:

- *Mo*

Planned:

- *Li*
- *Be*
- *Mo*

Single or no stable isotope:

- *F*

*Lanthanides*

- *Ce*
- *Pr*
- *Nd*
- *Pm*
- *Sm*
- *Eu*
- *Gd*
- *Tb*
- *Dy*
- *Ho*
- *Er*
- *Tm*
- *Yb*
- *Lu*

**Actinides**

- *Th*
- *Pa*
- *U*
- *Np*
- *Pu*
- *Am*
- *Cm*
- *Bk*
- *Cf*
- *Es*
- *Fm*
- *Md*
- *No*
- *Lr*

This is what we analyse: \( \delta^{13}S, \delta^{18}O, ^{87}\text{Sr}/^{86}\text{Sr} \)

This is what we need (<20 mg)
HISTORICAL ALABASTER ZONES IN W AND S EUROPE

- Cumbria
- North Yorkshire
- English Midlands
- Harz
- Franconia
- Jura
- Alps
- Provence
- Tuscany, Volterra
- Aragon, Catalonia
- Witzenhausen
- Forchtenberg
- Midlands
THE « WITZENHAUSEN » ALABASTER: GEOLOGY, GEOGRAPHY, USES

Country/Region: Germany/ Hessen, Hundelshausen
Age: Permian (Zechstein)
Lithology/Accompanying rocks: gypsum and anhydrite, light to dark grey, often brecciated.
Uses: Sculpture, 19-21st cent.: plaster
THE « WITZENHAUSEN » ALABASTER, HISTORY

1458: Artisan Kurt Krug, quarries exploited for tombstone of Ludwig I, unknown church in Kassel
1460-1469: documented transport of alabaster from Witzenhausen to Kassel
1516: funeral monument of Wilhelm II of Hesse, by Ludwig Juppe using alabaster from Witzenhausen...
THE FORCHTENBERG ALABASTER: GEOLOGY, GEOGRAPHY, USE

**Country/Region:** Germany/Hohenlohe, Baden Württemberg  
**Age:** Triassic (Middle Muschelkalk)  
**Lithology/Accompanying rocks:** Layered structure, gypsum + anhydrite/ dolomites, gray claystones, bituminous limestones, halite (mostly dissolved)  
**Uses:** Sculpture till the 17th cent., whitewash, fertilizer, plaster
THE FORCHTENBERG ALABASTER: HISTORY

16th – 17th cent: Exploitation of a private mining gallery by the Kern dynasty. Four generations of sculptors. Prominent members: Michael Kern II (1555-1634), Michael Kern III (1580-1649), Leonard Kern (1588-1663), Achilles Kern (1607-1691)

After 1750: gypsum as fertiliser

1750-1953: gypsum for plaster production

1875: Historical gallery under the house of the Kern family plugged

1953: End of gypsum exploitation in Forchtenberg
ISOTOPE FINGERPRINTS

Forchtenberg

Witzenhausen

Tumba Wilhelm II of Hessen, 1516
CONCLUSIONS AND PERSPECTIVES

Witzenhausen and Marburg funerary monument (1516):
• Permian alabaster close to Hundelshausen (Sr & S isotopes)
• Similarities to other Permian Alabaster deposits (Nordhausen)
• Precise location of historical quarries still to be elucidated (slight deviation of O isotopes of modern quarry compared to artwork), historical research needed, archives

Forchtenberg:
• Well-defined isotope signature, distinct from other German quarries should enable us to identify Forchtenberg alabaster in artworks

THANK YOU FOR YOUR ATTENTION!