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MEDIEVAL AND EARLY MODERN ALABASTER EXPLOITATIONS IN GERMANY: ISOTOPE FINGERPRINTS OF THE FORCHTENBERG AND WITZENHAUSEN DEPOSITS AND THEIR USE IN SCULPTURE

Wolfram Kloppmann, Lise Leroux, Philippe Bromblet, Pierre-Yves Le Pogam, Catherine Guerrot, and Anne Thérèse Montech



Géosciences pour une terre durable

brgm

WHAT IS ALABASTER?

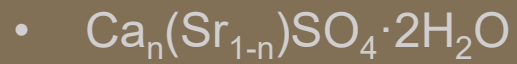
The noble variety of gypsum :



or of anhydrite :



With a little bit of strontium :



Pulpit statue (1600-1610), Michael Kern III, Würzburg cathedral, Germany

THE ISOTOPE TOOLBOX

1 *H 1.008																	2 He 4.00				
3 Li 6.94	4 Be 9.01															5 B 10.81	6 *C 12.01	7 *N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 23.00	12 Mg 24.31															13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.71	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80				
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc 98.91	44 Ru 101.07	45 Rh 102.90	46 Pd 106.40	47 Ag 107.90	48 Cd 112.40	49 In 114.80	50 Sn 118.70	51 Sb 121.80	52 Te 127.60	53 I 126.90	54 Xe 131.30				
55 Cs 132.90	56 Ba 137.30	57 La* 138.90	72 Hf 178.50	73 Ta 181.00	74 W 183.90	75 Re 186.20	76 Os 190.20	77 Ir 192.20	78 Pt 195.10	79 Au 197.00	80 Hg 200.60	81 Tl 204.40	82 Pb 207.20	83 Bi 209.00	84 Po (210)	85 At (210)	86 Rn (222)				
87 Fr (223)	88 Ra (226)	89 Ac** (227)	104 Rf (258)	105 Db (260)																	

B Routine analyses at BRGM

***C** Compound specific isotope analysis

Mo Under development

Sn Planned

F Single or no stable isotope

*Lanthanides
Дмитрий Менделеев
Dmitri Mendeleiev
**Actinides

58 Ce 140.10	59 Pr 140.90	60 Nd 144.20	61 Pm (145)	62 Sm 150.40	63 Eu 152.00	64 Gd 157.30	65 Tb 158.90	66 Dy 162.50	67 Ho 164.90	68 Er 167.30	69 Tm 168.90	70 Yb 173.00	71 Lu 175.00
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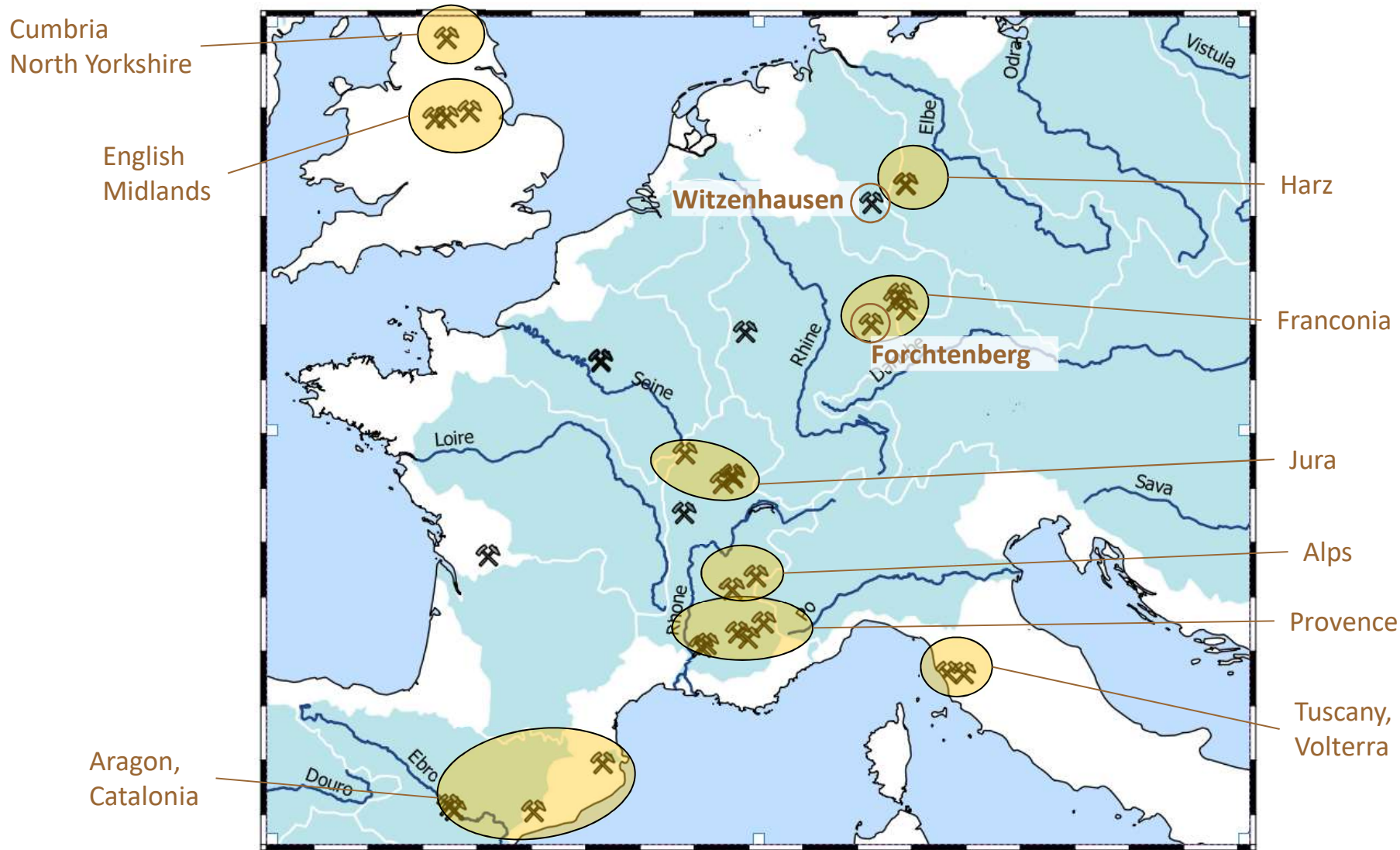
90 Th 232.00	91 Pa 231.00	92 U 238.00	93 Np 237.00	94 Pu 239.10	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (254)	100 Fm (257)	101 Md (256)	102 No (254)	103 Lr (258)
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 This is what we analyse: $\delta^{34}\text{S}$, $\delta^{18}\text{O}$, $^{87}\text{Sr}/^{86}\text{Sr}$



This is what we need (<20 mg)

HISTORICAL ALABASTER ZONES IN W AND S EUROPE



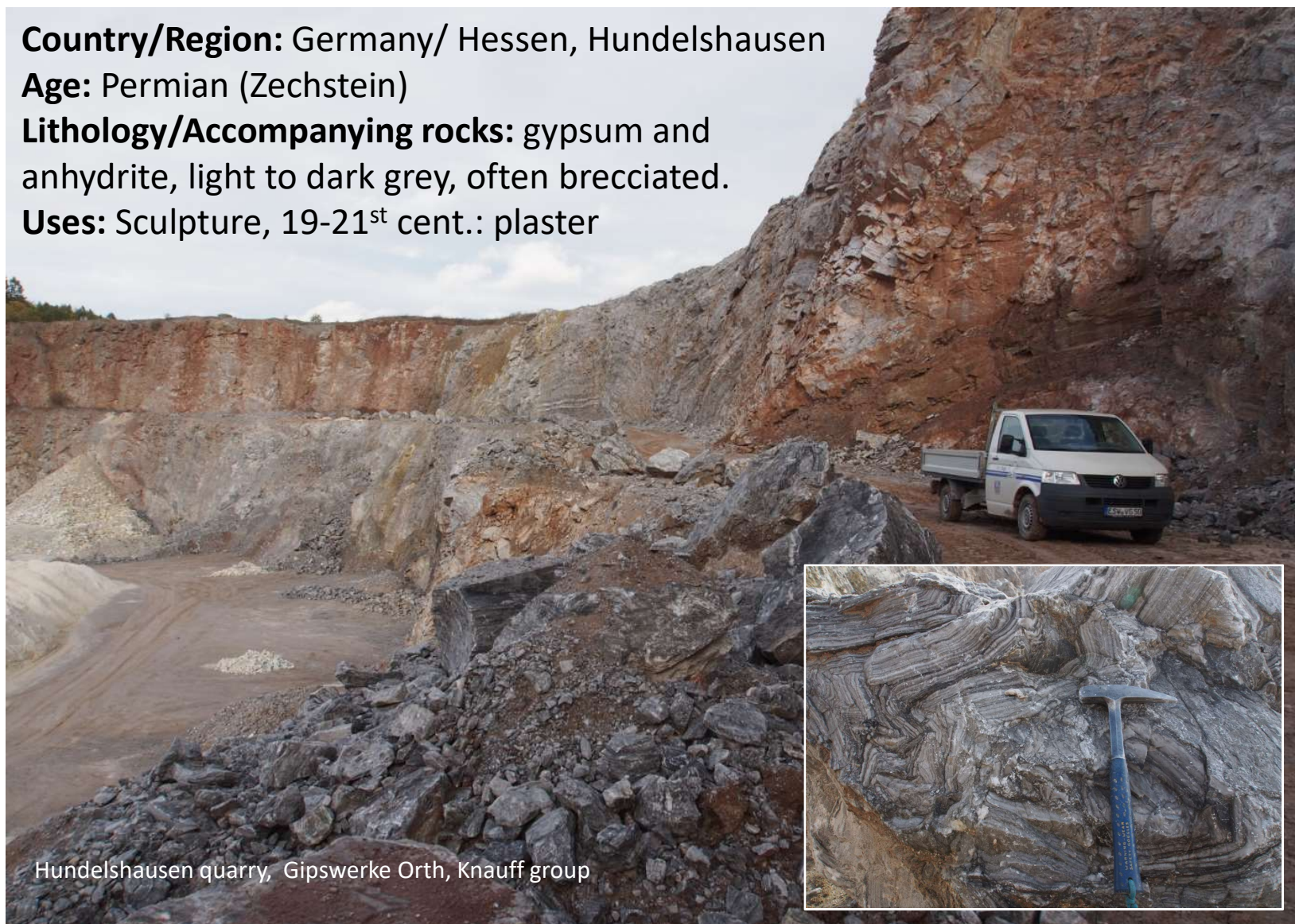
THE « WITZENHAUSEN » ALABASTER: GEOLOGY, GEOGRAPHY, USES

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



Hundelshausen quarry, Gipswerke Orth, Knauff group

THE « WITZENHAUSEN » ALABASTER, HISTORY



Historical sight of Witzenhausen, 1572 (Reyer, 1986)



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



First house of the Kern Family in Forchtenberg, A mining gallery provides direct access to the alabaster deposit

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

Pulpit statue (1600-1610), Michael Kern III, Würzburg cathedral, Germany

ISOTOPE FINGERPRINTS



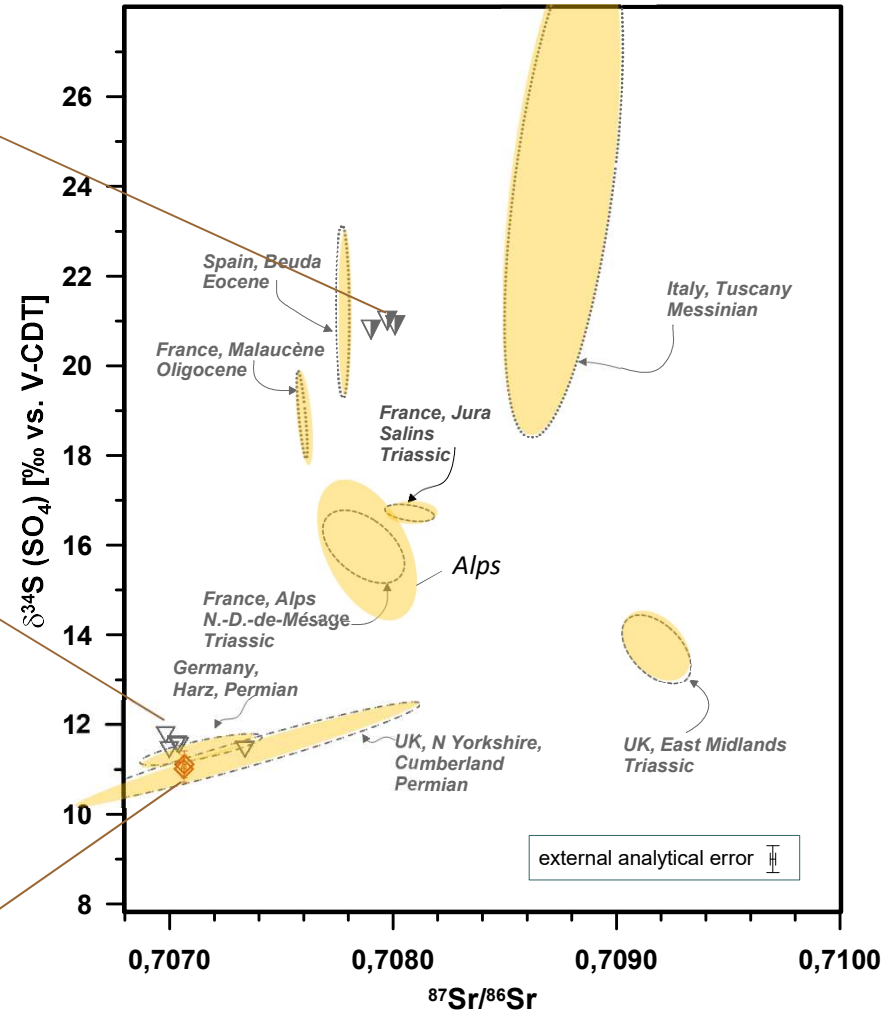
Forchtenberg



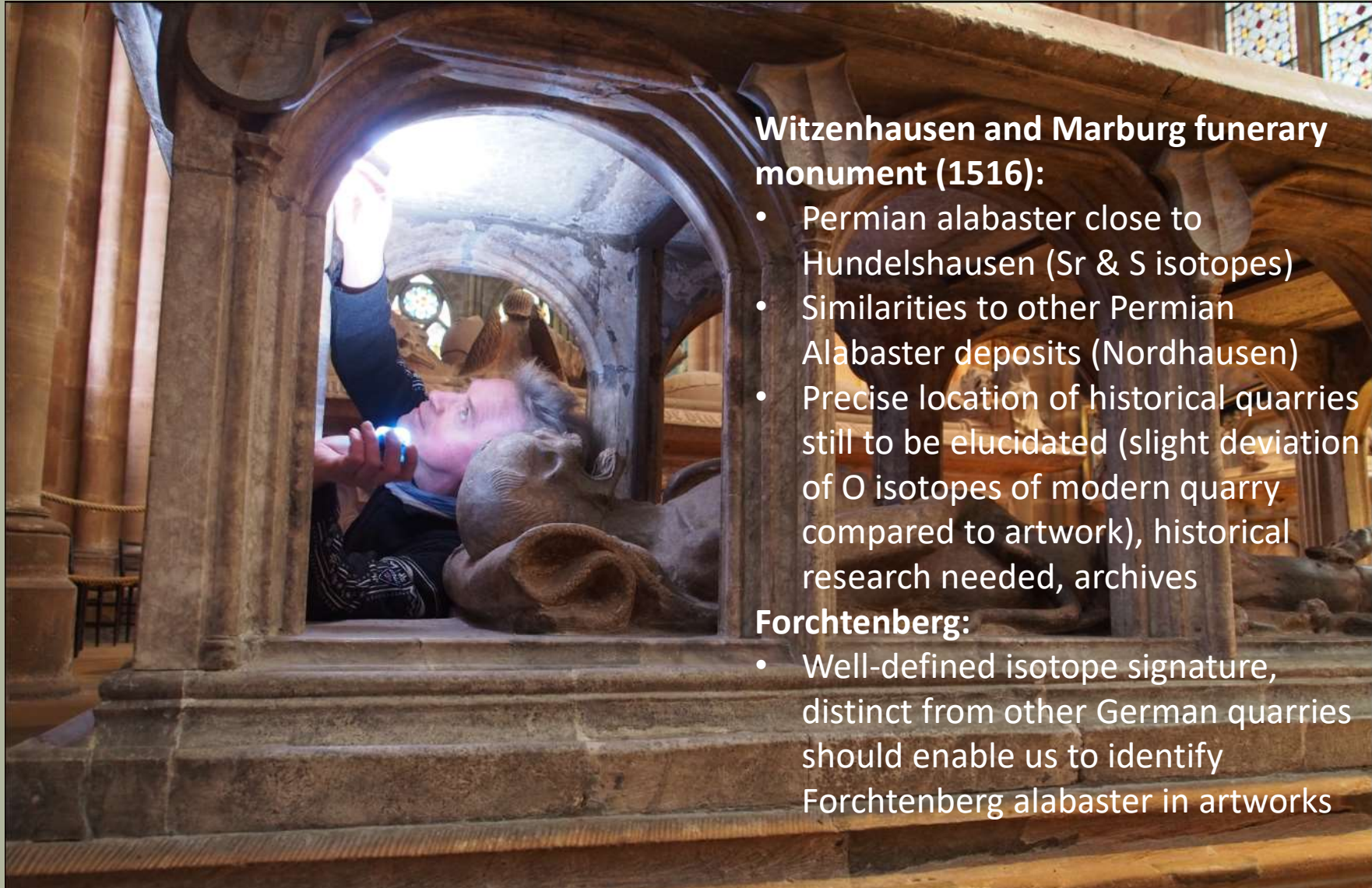
Witzenhausen



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 !