ALL THAT GLITTERS IS NOT GOLD: CHARACTERIZATION OF METALLIC DECORATIVE ELEMENTS FROM FIVE ENCLOSED GARDENS

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BH 3: Calvary with Mary and John the Baptist © KIK-IRPA

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BH2: Saints Elisabeth, Ursula and Catherine

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BH6: Saints Augustine, Anna Selbdritt, Mary and Child

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BH1: Calvary and hunt on the unicorn

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BH 4: Daniel in the lion's den

- ❑ 5 reliquary altarpieces
- ❑ 16th century
- ❑ Preserved by the sisters of the Onze-Lieve-Vrouwegasthuis of Malines (Belgium)

- ❑ Huge diversity
- ❑ Several well-preserved golden metallic elements

Focus on metallic decorative elements

Gilded wooden sculptures

- ❖ Gilded polychrome sculptures

Gothic elements

- ❖ Decorative elements on wooden sculptures
- ❖ Often degraded

Back-plates

- ❖ Shiny/glossy thin foils
- ❖ Pristine conservation state
- ❖ Gilded?

Insignias

- ❖ Diverse appearance
- ❖ Different materials?

Sequins

- ❖ Abundant in all the panels
- ❖ Well-preserved
- ❖ Similar to back-plates

WHY OUR RESEARCH?

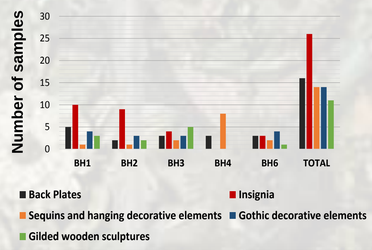
- ❑ For conservation purposes
- ❑ To acquire more historical and technical information

➡

1. **Differences between panels?**
2. **Are back-plates and sequins gilded?**

HOW?

- ❖ p-XRF analysis in-situ



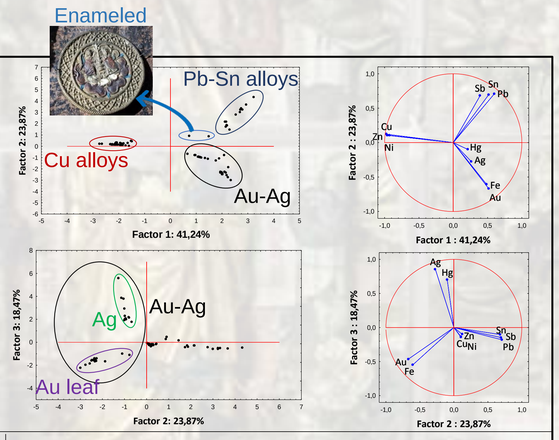
- ❖ Laboratory analysis on five loose sequins

- OM
- SEM-EDX
- XRD
- µ-Raman
- FTIR-ATR

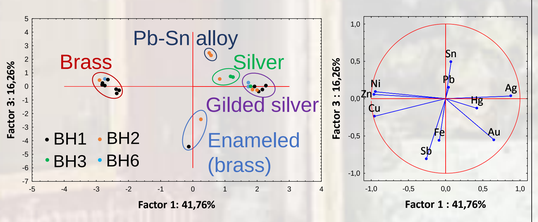
Analysis in-situ

- ❖ Exploratory PCA

1. Cu alloys (= leaded brass):
   - Back-plates
   - Sequins
   - Insignias
2. Lead-Tin alloys:
   - Gothic decorative elements (gilded)
   - Insignias
3. Silver:
   - Insignias
4. Gold leaf:
   - Gilded sculptures

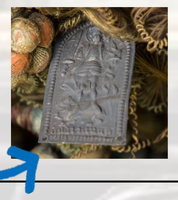


- ❖ Insignias

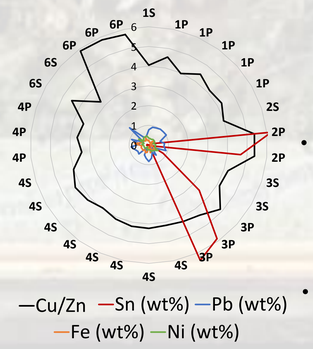


No significant distinction between different panels

Most silver insignias show residues of gilding (mostly not visible)



- ❖ Sequins (S) and back plates (P)



Leaded brass (Cu:Zn≈80:20)

NOT gilded

- Back plates:
  - BH2,BH3 → High Sn
  - BH6 → Higher Cu/Zn
  - no technical reason (all well-preserved)
- Sequins:
  - NO differences

Why so well preserved?

Laboratory analysis: why is leaded brass so well preserved?

- ❖ NO organic protective layer (no FTIR-ATR signal)
- ❖ Protective metallic surface layer?

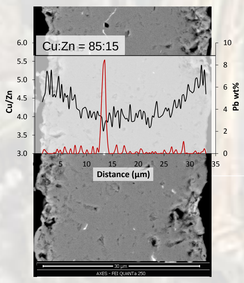
SEM-EDX(Surface)

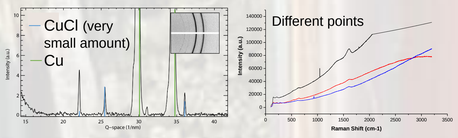
	Al	Si	S	Cl	K	Ca	Fe	Ni	Cu	Zn	Cu/Zn
Surface (Area)	0.4	0.1	0.1	0.1			0.4	0.3	**84.6**	**14.0**	**6.1**
Surface (Point 1)	0.3			0.1			0.3	0.2	**86.3**	**12.7**	**6.8**
Surface (Point 2)	0.2		0.1	0.1			0.4	0.3	**85.4**	**13.5**	**6.3**
Surface (Point 3)	0.3		0.1	0.1			0.2	0.2	**84.6**	**14.6**	**5.8**
Surface (dust)	**22.0**	**39.6**	0.5	0.9	2.1	2.6	**25.8**		3.9	1.0	4.1

No Pb on the surface

Higher Cu/Zn ratio on the surface than in the bulk

Cu:Zn ≈ 85:15 corresponds to a more golden color





Discrete distribution of Pb (not soluble in the alloy)

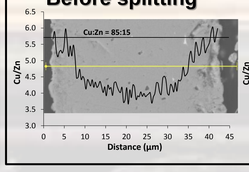
Increase of Cu/Zn towards the surface is confirmed

Degradation process (dezincification) **or voluntary treatment** (diluted acid) to tune the optical properties of brass**?**

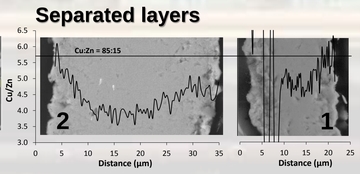
- ❖ Sequin with detached surface layer

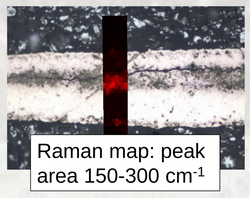
1. Well-preserved surface layer
2. Tarnished inner layer

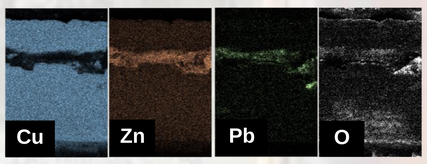
Before splitting



Separated layers







Detached surface layer → more porous and slightly higher Cu/Zn

Internal corrosion layer rich in Zn, Pb and O before splitting of inner and outer layer (Metal oxides and/or chlorides - Raman).

Probably consequence and not cause of the detachment.

But why no degradation products on the outer surfaces of the sample?

CONCLUSIONS

The results of this study showed no clear and systematic difference between the metallic decorative elements in the different Enclosed Gardens. Small compositional variations were observed only in the brass back-plates decorating the background of the panels. However, these slight changes do not seem to be justified by any technological need and show no effect on the overall stability.
All the lead-tin gothic elements decorating the wooden sculptures, as well as most of the silver insignas, presented residues of gilding. On the contrary, none of the brass objects showed any traces of gold. The golden appearance of brass back-plates and sequins is in fact only related to a higher Cu/Zn ratio on the surface. It is not clear whether this dezincification is the result of a degradation processes or of a surface treatment aiming at enhancing the gold-like appearance of the metal. Contrarily to what expected, this porous Zn-depleted surface layer seems to protect the alloy from further degradation. The presence in the Gardens of large amounts of silk, potentially acting as a chemical sieve against gaseous pollutants, might also have positively influenced the overall stability of the brass elements.

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