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## Pigment characterization of important golden age panel paintings of the 17th century



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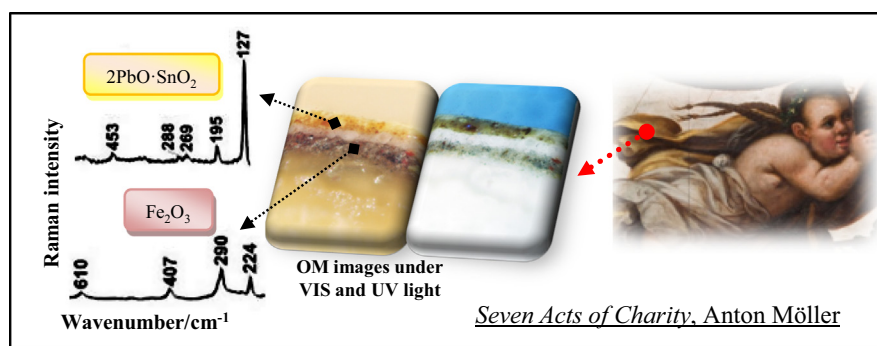
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### HIGHLIGHTS

- Vibrational analysis of panel paintings: *Seven Acts of Charity* and *Angelic Concert*.
- Spectroscopic identification of ground layers and admixture of pigments.
- Determination of the pictorial technique.

### GRAPHICAL ABSTRACT



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### ABSTRACT

Samples were obtained from two world-famous 17th century panel paintings of the Gdańsk school of painting: 'Seven Acts of Charity' (1607, in St. Mary's Church in Gdańsk, Poland) by Anton Möller and 'Angelic Concert' (1611, in Diocesan Museum in Pelplin, Poland) by Hermann Han. Micro-Raman spectroscopy (MRS), optical microscopy (OM), and X-ray fluorescence (XRF) spectroscopy studies of the samples were performed to characterize the pigments present in the individual painting layers (a rich palette of white, black, blue, red, and yellow pigments) and the pictorial techniques used by the artists.

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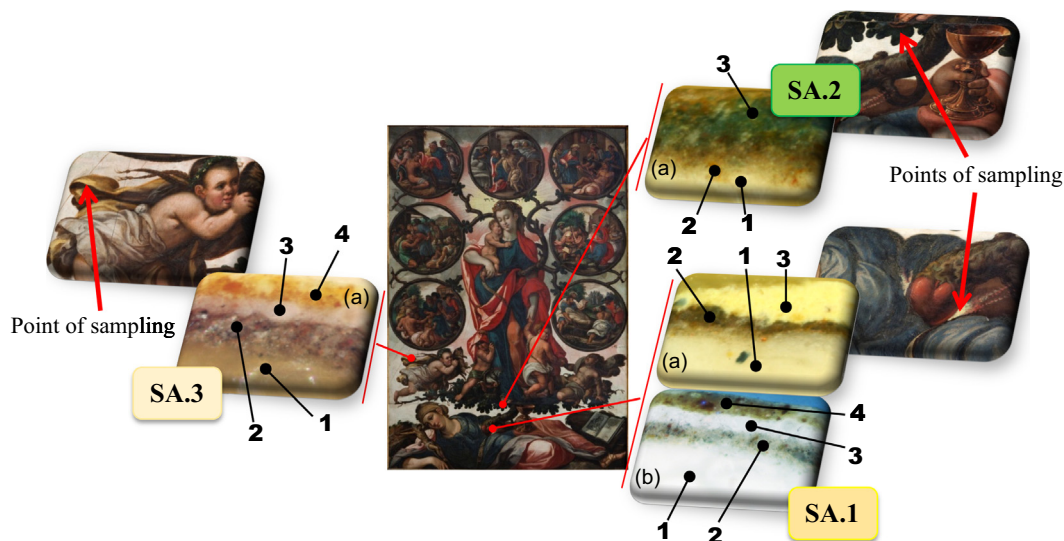
### Introduction

'Seven Acts of Charity' (1607, in St Mary's Church in Gdańsk, Poland) – the main painting of the Alms Table and the painting

from the donation boxes collection – by Anton Möller (1563/5–1611) (Fig. 1) and 'Angelic Concert' (1611, in Diocesan Museum in Pelplin, Poland) – an altar predella originally located in the Cathedral in Pelplin – by Hermann Han (1580–1627/8) (Fig. 2) are world-famous panel paintings of the 17th century Golden Age. These pieces of art were created by two outstanding painters who worked in Gdańsk. Anton Möller arrived in Gdańsk from

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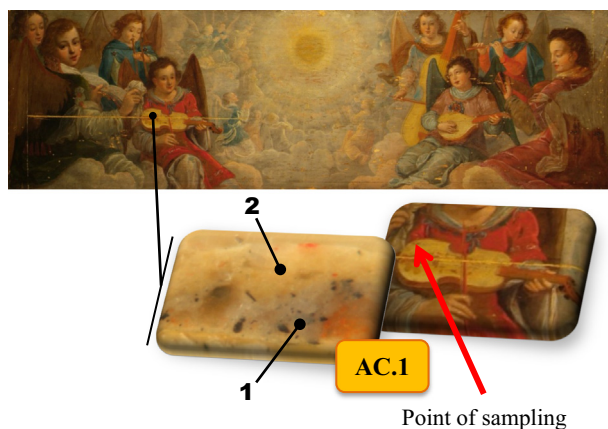


**Fig. 1.** 'Seven Acts of Charity' (1607, St Mary's Church in Gdańsk) by Anton Möller and the OM images of the micro-sample cross-sections: SA.1 – the yellow impasto of light, SA.2 – the green leaf, and SA.3 – the yellow robe (under visible (a) and ultraviolet (b) light). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

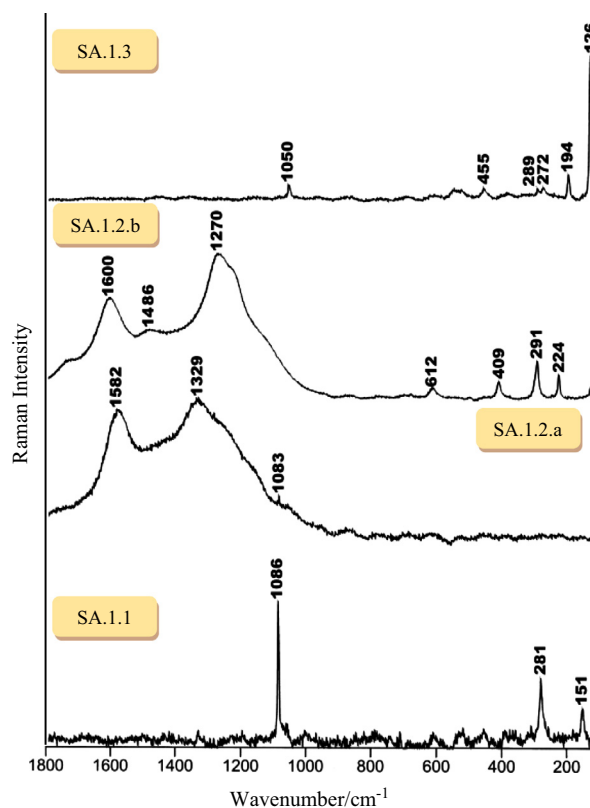
Koenigsberg. He is best known for Biblical themes and allegorical compositions that are often compared to the art of Flanders and the Netherlands. His art was influenced by Netherlandish and German painters [1]. Hermann Han was Netherlandish but born in Gdańsk. His early works were devoted to morality scenes. However, he is mostly known for altar paintings depicting St. Mary and compositions related to the history of the Church for Cistercians in Pelplin (The Royal Prussia; currently Poland) and Oliwa (Poland). As a great master, he was appointed as the Polish King's Painter [2].

Toward the end of the Middle Ages, Gdańsk grew rapidly, becoming in the 16th century the largest city on the Baltic seaboard. Maintaining close cultural and trade relations with the Netherlands and Germany, this city became an artistic center in Europe. Historical sources point to Gdańsk as a center of the timber trade for the entire Baltic. The timber was floated down on the Vistula River, whose mouth is situated in the city [3]. The Gdańsk and Netherlandish artists, unlike the Italian painters who used less durable species of wooden panels grounded by animal glue, painted mainly on oak panels whitewashed by ground consisting

of chalk [ $\text{CaCO}_3$ ] and animal glue [4–6]. 'Seven Acts of Charity',  $291 \times 189$  cm in dimensions, is painted on a wooden panel made of nine boards most likely oak, whereas 'Angelic Concert',  $40 \times 135$  cm in dimensions, is painted on a panel made of four linden boards.



**Fig. 2.** 'Angelic Concert' (1611, Diocesan Museum in Pelplin) by Hermann Han and the OM image of the micro-sample cross-section: AC.1 – the yellow violin. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)



**Fig. 3.** The MRS spectra of sample SA.1 – the yellow impasto of light (the yellow colored region); SA.1.1 white ground layer – chalk, SA.1.2 brown imprimatura – a: mixture of chalk and carbon-based pigment, b: mixture of hematite and carbon-based pigment, SA.1.3 yellow layer – mixture of lead tin yellow type I and lead white. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

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