

SUPPLEMENTARY



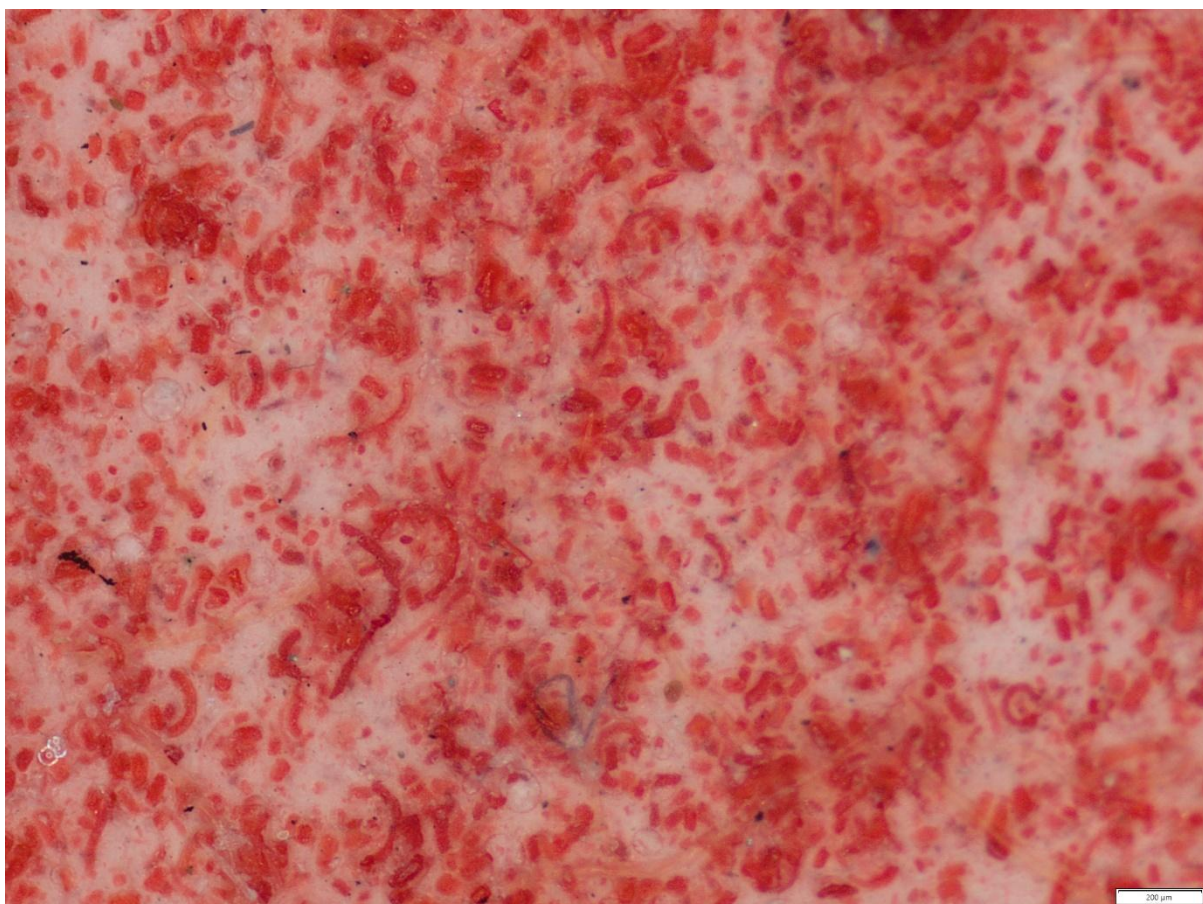
Supplementary Figure 1 Dyeing of blue and red wool in copper vat, coloured ink drawing from the Hausbuch der Landauerschen Zwölfbrüderhausstiftung, Vol. 1, Nuremberg, Germany, 1511-1706 (Amb. 279.2°, Folio 13 recto), © Stadtbibliothek im Bildungscampus Nürnberg.



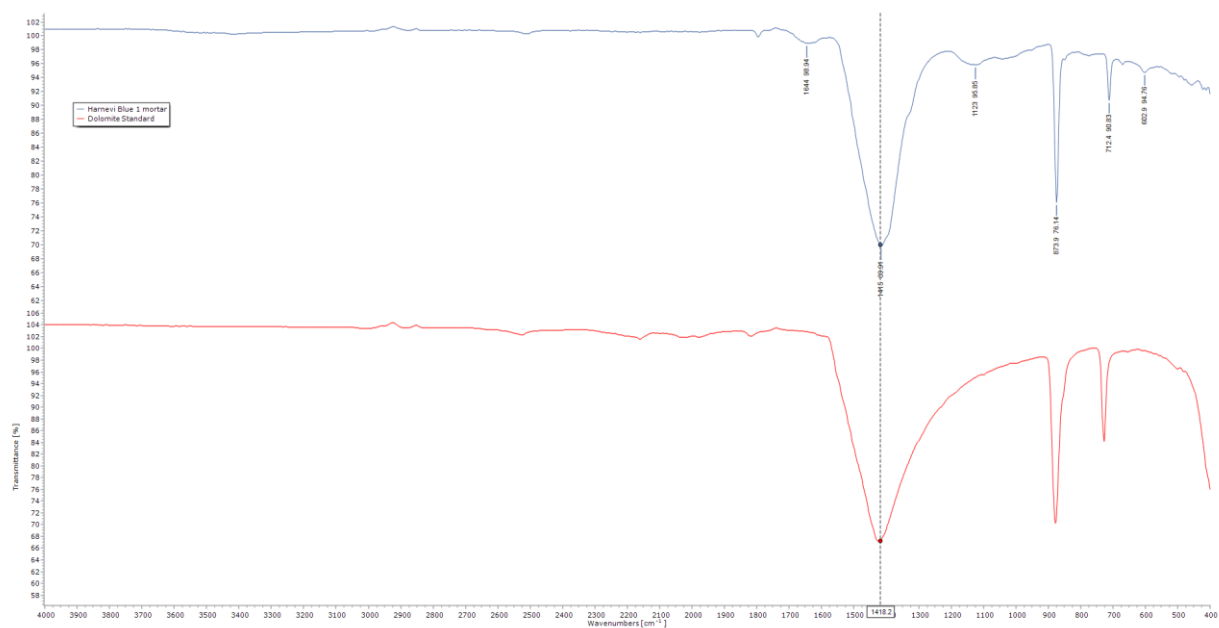
Supplementary Figure 2 The finished reconstruction. The reconstruction of woolly lake pigment using the *Nürnberg Kunstbuch* recipe. The pigment was applied in two layers to mimic the findings in Härnevi. It was applied to a lime slurry ground sized with rabbit skin glue. For the first pink layer the red lake pigment was mixed with chalk and tempered with rabbit skin glue. For the second layer the lake pigment was tempered with rabbit skin glue, linseed oil and egg yolk respectively.



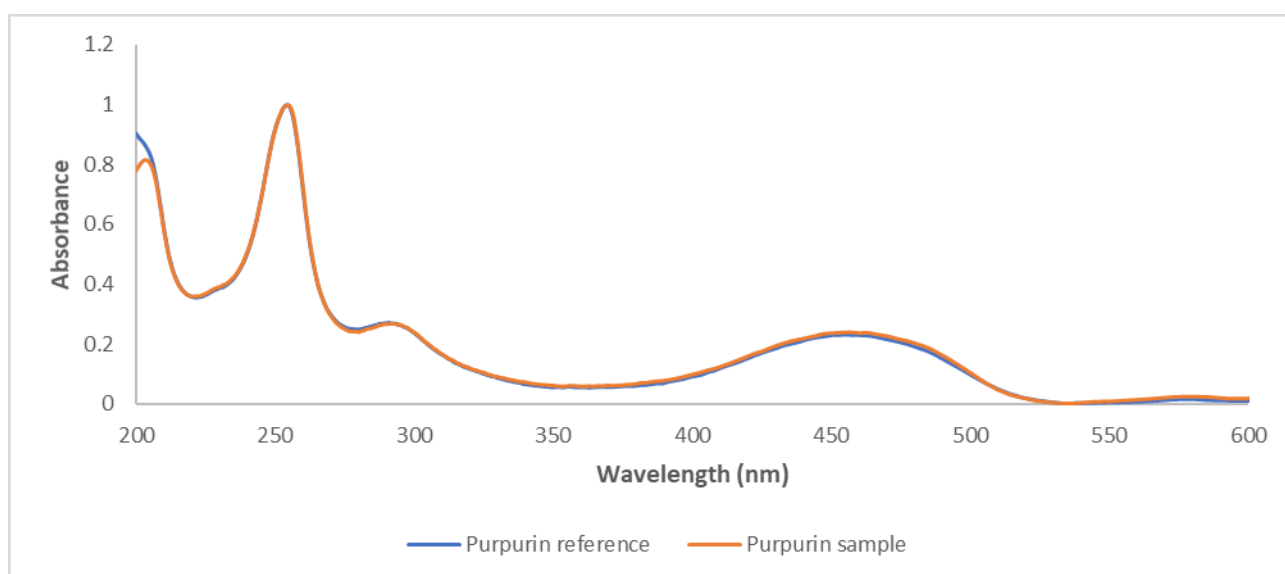
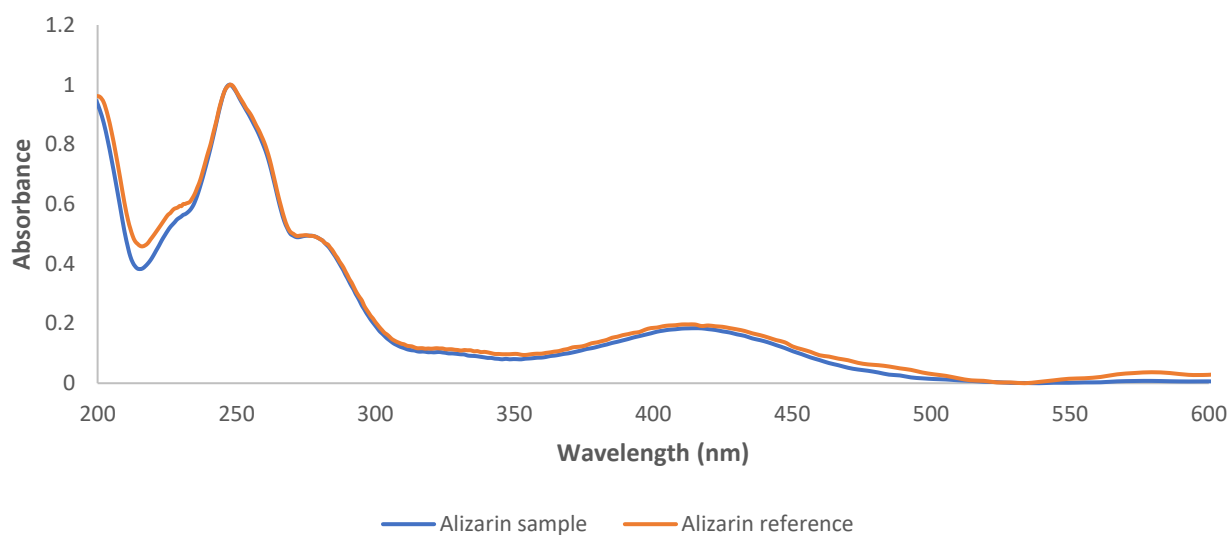
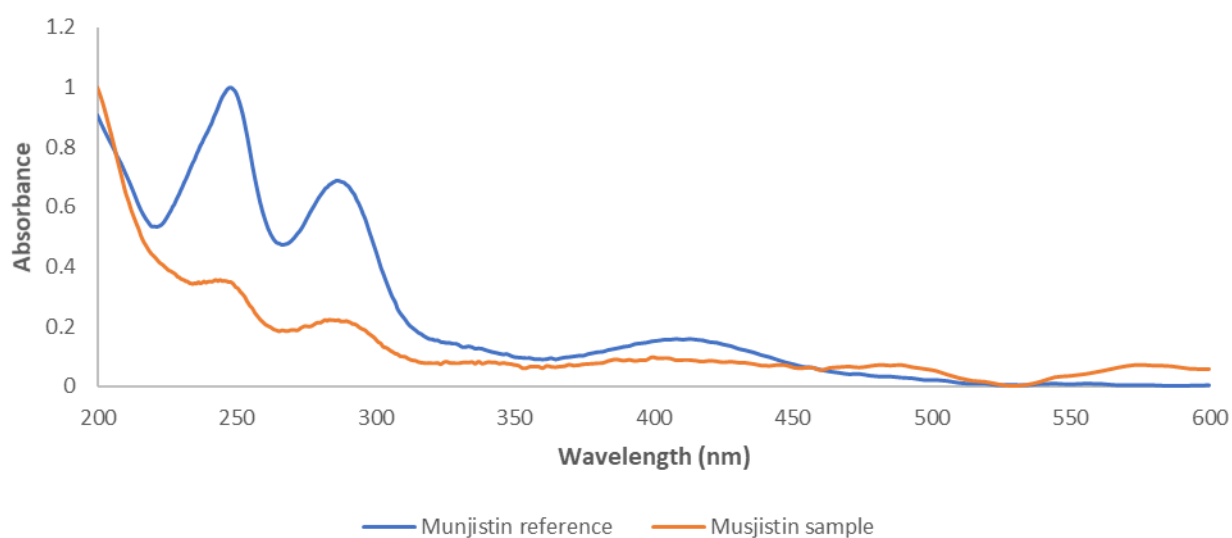
Supplementary Figure 3 Batch 1 of the reconstructed pigment using the *Nürnberg Kunstbuch* recipe from c. 1450.



Supplementary Figure 4 Stereomicroscopic image of reconstructed red woolly lake pigment showing very similar particle morphology and sizes to the fibres observed in Härnevi church, 45x magnification.



Supplementary Figure 5 Sample Blue 1, FTIR analysis, spectrum of slurry which contains some dolomite (BLUE). Reference spectrum of dolomite (RED)



Supplementary Figure 6 HPLC-DAD, UV spectra of extracted dyestuff confirm the molecules of the components munjistin, alizarin and purpurin.

Location, object, support, date	Description	Results of analysis	Analysts, Reference
Rohr (Lower Bavaria), Germany, Benedictine Monastery church, monumental polychrome wooden crucifix, 14 th /15 th C, artist unknown	Oldest polychromy (probably original polychromy), red paint layers (blood drops surrounding wound on head – crown of thorns)	Large irregular often fibrous red particles: reddish orange fluorescence under ultraviolet light suggests madder (optical microscopy). Madder (HPLC). Strong peaks for Al and S, medium peaks for K, and Ca, small peaks for Si, Pb, Na, and Cl (SEM-EDX)	Christian Gruber, Anna Rommel, Mark Richter, Central Laboratory, Bavarian State Department of Historical Monuments (Munich); Jana Sanyova, Royal Institute for Cultural Heritage, KIK/IRPA, Brussels
Franconia(?), Germany, Sts Lawrence, Stephen, Holy Bishop, Simon, Jude, panel painting, c. 1470, artist unknown	St Stephen (deacon), dark red dalmatic, paint sample taken from loss around the middle of his chest. Large particles: orange fluorescence under ultraviolet light suggests madder	Large irregular often fibrous red particles: reddish orange fluorescence under ultraviolet light suggests madder (optical microscopy). Strong peaks for S and Ca, medium peaks for Al and Cl, small peaks for K, Na, Mg, Pb, Si (SEM-EDX)	Klaus Rapp, freelance microanalyst, Munich; Mark Richter, Bavarian State Department of Historical Monuments (Munich)
Rothenburg o. d. Tauber, Germany, Parish church of St. James, Holy Blood wooden retable with partial polychromy by Tilman Riemenschneider and workshop, 1499-1505	'Last Supper' (central scene of retable), Sculpture of Christ, sample P2 taken from red paint on Christ's upper lip by Hermann Kühn (1964/65), Doerner Institut, Munich. Large particles: orange fluorescence under ultraviolet light suggests madder	Red particles with an irregular to much more fibrous shape: reddish orange fluorescence under ultraviolet light suggests madder (optical microscopy). Strong peaks for Al and S, medium peaks for P, Ca, Cl and K, small peaks for Cu, Na, Pb, Mg and Si (SEM-EDX)	Klaus Rapp, freelance microanalyst, Munich; Mark Richter, Technical University Munich (Munich);
Västmanland county, Sweden, Kumla church, mural paintings attributed to Albertus Pictor's workshop, c. 1480	Fragments of red paint preserved in the pores of the plaster on both decorative and figurative elements.	Large fibrous red particles: reddish orange fluorescence under ultraviolet light suggests madder (optical microscopy)	Elin Lundmark , freelance conservator. Solna
Uppsala county, Sweden, Almunge church, mural paintings attributed to Albertus Pictor's workshop, 15 th C	Fragments of red paint preserved in the pores of the plaster on both decorative and figurative elements.	Large fibrous red particles: reddish orange fluorescence under ultraviolet light suggests madder (optical microscopy)	Elin Lundmark , freelance conservator. Solna
Västernorrlands county, Sweden, Ytterlänns church, mural paintings. Unknown workshop but associated with Tierpskolan, 15 th C	Fragments of red paint on both decorative and figurative elements.	Large fibrous red particles: reddish orange fluorescence under ultraviolet light suggests madder (optical microscopy)	Elin Lundmark , freelance conservator. Solna
Västernorrlands county, Sweden, Ytterlänns church, monumental polychrome wooden crucifix, 14 th C	Red paint layers on flowers adorning the four cross endings.	Large fibrous red particles: reddish orange fluorescence under ultraviolet light suggests madder (optical microscopy)	Elin Lundmark , freelance conservator. Solna

Supplementary Table 1 Further recent findings of red fibrous lake pigments in fourteenth- and fifteenth-century wall paintings, sculpture polychromy and panel painting in Sweden and Germany.