

ANCIENT MONUMENTS LABORATORY REPORT NO 4540

ANALYSIS OF ANGLO-SAXON PIGMENTS FROM YORK MINSTER

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March 1985

The pigments remaining on an Anglo-Saxon grave slab (AM840898) and an Anglo-Saxon carved stone (AM840899) were examined. The pigments were analysed elementally using energy dispersive X-ray fluorescence (X.R.F.). Identification of the major crystalline compounds present was carried out using X-ray diffraction (X.R.D.) Some of the X.R.D. samples were treated with dilute hydrochloric acid to remove any calcium carbonate in the sample.

AM840898 Fields of white and of red were present. The white pigment was not distinguishable from the white ground which was below the red pigments. The white pigment and ground were calcite (calcium carbonate, CaCO_3). Haematite and quartz were detected by X.R.D. of the red pigment after acid treatment. The pigment is haematite (iron oxide Fe_2O_3) and the quartz was probably from the stone itself. Both calcite and haematite are common mineral pigments and their use is not therefore surprising.

AM840899 Fields of white and of red with a white ground were present. The pigments used were again calcite and haematite.

The red and white pigments remaining on two pieces of Anglo-Saxon stonework, a grave slab (AM 840~~898~~⁸⁹⁸) and a carved stone (840899) were examined. The pigments were analysed elementally using energy dispersive X-ray fluorescence (X.R.F.). Identification of the ^{major} crystalline compounds present was carried out using X-ray diffraction (X.R.D.). ~~Some of~~ Some of the samples for X.R.D. had to be treated with dilute hydrochloric acid to remove ~~the~~ ~~calcite~~ (calcite) any calcium carbonate in the sample.

AM 840898 ~~This object had areas with~~ ~~The white pigment was not~~ ~~distinguishing~~ ~~from the~~ ~~white~~ ~~ground~~ ~~and~~ ~~areas of~~ ~~white~~ ~~pigment~~ ~~was~~ ~~not~~ ~~indistinguishable~~ ~~from~~ ~~the~~ ~~white~~ ~~ground~~ ~~below~~ ~~the~~ ~~red~~ ~~pigment~~. ~~Only~~ ~~calcium~~ ~~was~~ ~~detected~~ ~~at~~ ~~high~~ ~~levels~~ ~~by~~ ~~X.R.F.~~ ~~analysis~~. ~~Both~~ ~~the~~ ~~white~~ ~~and~~ ~~red~~ ~~pigments~~, ~~which~~ ~~are~~ ~~also~~ ~~found~~ ~~in~~ ~~the~~ ~~white~~ ~~ground~~, ~~and~~ ~~areas~~ ~~of~~ ~~white~~ ~~pigment~~ ~~was~~ ~~not~~ ~~indistinguishable~~ ~~from~~ ~~the~~ ~~white~~ ~~ground~~ ~~below~~ ~~the~~ ~~red~~ ~~pigment~~. ~~High~~ ~~levels~~ ~~of~~ ~~calcium~~ ~~were~~ ~~detected~~ ~~in~~ ~~the~~ ~~white~~ ~~pigment~~ ~~areas~~ ~~and~~ ~~high~~ ~~levels~~ ~~of~~ ~~calcium~~ ~~and~~ ~~iron~~ ~~were~~ ~~detected~~ ~~in~~ ~~the~~ ~~red~~ ~~pigment~~ ~~areas~~. ~~The~~ ~~white~~ ~~pigment~~ ~~was~~ ~~not~~ ~~indistinguishable~~ ~~from~~ ~~the~~ ~~white~~ ~~ground~~ ~~below~~ ~~the~~ ~~red~~ ~~pigment~~.

~~The pigment used in the white areas was~~
 White: ~~Calcium~~ ~~was~~ ~~detected~~ ~~at~~ ~~high~~ ~~levels~~ ~~by~~ ~~X.R.F.~~ ~~analysis~~. ~~Only~~ ~~calcium~~ ~~was~~ ~~detected~~ ~~at~~ ~~high~~ ~~levels~~ ~~by~~ ~~X.R.F.~~ ~~analysis~~. ~~and~~ ~~calcium~~ ~~calcite~~ ~~(~~ ~~calcium~~ ~~carbonate~~ ~~,~~ ~~CaCO₃)~~ ~~was~~ ~~identified~~ ~~by~~ ~~X.R.D.~~. ~~The~~ ~~pigment~~ ~~in~~ ~~the~~ ~~white~~ ~~areas~~, ~~which~~ ~~were~~ ~~not~~ ~~indistinguishable~~ ~~from~~ ~~the~~ ~~white~~ ~~ground~~ ~~below~~ ~~the~~ ~~red~~ ~~pigment~~, ~~was~~ ~~calcite~~.

Red: ~~Only~~ ~~iron~~ ~~was~~ ~~detected~~ ~~at~~ ~~significantly~~ ~~higher~~ ~~levels~~ ~~in~~ ~~the~~ ~~red~~ ~~pigment~~ ~~areas~~ ~~than~~ ~~in~~ ~~the~~ ~~white~~ ~~areas~~, ~~and~~ ~~haematite~~ ~~(~~ ~~iron~~ ~~oxide~~ ~~,~~ ~~Fe₂O₃)~~ ~~and~~ ~~quartz~~ ~~were~~ ~~identified~~ ~~by~~ ~~X.R.D.~~ ~~of~~ ~~an~~ ~~acid~~ ~~treated~~ ~~sample~~. ~~The~~ ~~pigment~~ ~~used~~ ~~was~~ ~~haematite~~ ~~and~~ ~~the~~ ~~quartz~~ ~~present~~ ~~in~~ ~~the~~ ~~sample~~ ~~was~~ ~~almost~~ ~~certainly~~ ~~from~~ ~~the~~ ~~base~~ ~~stone~~. ~~itself~~.

AM 840899 ~~The results of X.R.F. and X.R.D. analyses were similar to the results for the~~
 White: ~~As for AM 840898, the white pigment, which was again indistinguishable from~~ ~~the white ground below the red pigment, was identified by X.R.D. as~~ ~~calcite~~. ~~As for AM 840898, the white pigment, which was again indistinguishable from~~ ~~the white ground below the red pigment, was identified by X.R.D. as~~ ~~calcite~~.

Red: ~~The white~~
 White: ~~Only~~ ~~calcium~~ ~~was~~ ~~detected~~ ~~at~~ ~~a~~ ~~high~~ ~~level~~ ~~by~~ ~~X.R.F.~~ ~~analysis~~, ~~and~~ ~~the~~ ~~pigment~~ ~~was~~ ~~identified~~ ~~as~~ ~~calcite~~ ~~by~~ ~~X.R.D.~~.

Red: ~~Only~~ ~~calcium~~ ~~and~~ ~~iron~~ ~~were~~ ~~detected~~ ~~at~~ ~~significant~~ ~~levels~~ ~~by~~ ~~X.R.F.~~ ~~analysis~~. ~~The~~ ~~pigment~~ ~~was~~ ~~identified~~ ~~as~~ ~~haematite~~ ~~by~~ ~~X.R.D.~~.

~~Haematite and calcite are the red and white pigments which would be expected on painted stonework of this period.~~

York Minster - south transept β saron wall pigments.

840899

Red pigment on white ground.

- Sample: P1 - ground
 P2 - pigment (+ ground)
 P3 - ~~ground with brown staining almost certainly dirt.~~

X.R.F. results

- P1 No heavy elements at significant levels. (trace Fe, Cu (?)). Ca.
 P2 Only Fe at a higher level than for P1.

Almost certainly iron oxide (haematite).

X.R.D results

P1 - calcite (+ quartz). Quartz maybe from the sandstone ~~in~~ block.

P2 - calcite (+ quartz). main Fe₂O₃ line present. Pigment almost certainly haematite. Acid dissolution of calcite in sample would help.

P3	-	840899	pigment + ground	(acid treated)	X.R.D 116	1
P4	-	840898	red + ground	(acid treated).	"	2
P5	-	"	pale red + ground	(")	"	3
P6	-	840898	ground.		"	4

P3 - some soil probably included.

X.R.F of:

P3	Fe	(Ca)	} No evidence for anything except haematite & calcite.
P4	Fe	(Ca)	
P5	Ca, Fe	(Ca, Zn, Pb) Ca, Fe	
P6	total Ca	Fe (Cu, Zn, Pb)	