Presented at Icon Heritage Science Group's 'Historic document analysis using p-XRF: Pitfalls and Possibilities', The National Archives UK, 11th September 2017.

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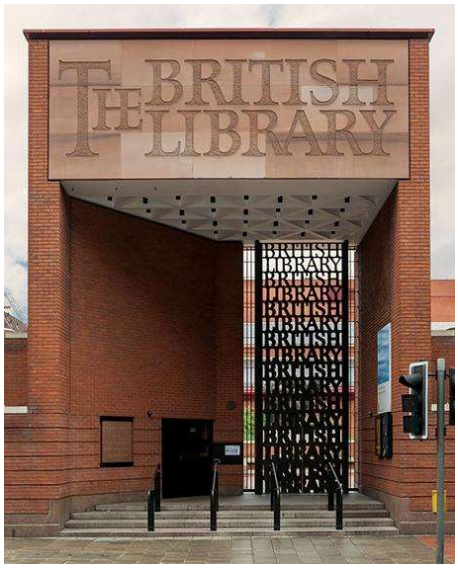
The British Library



The BL collection contains roughly 150 million items.

Collection Care ensures that items are fit for use by readers and scholars.

Analysis of structure and composition informs conservation decisions and scholarship.

Analytical Techniques

- Material characterisation
- Pigment analysis
- Assessment of physical properties
- Stability testing
- Chemical and physical state

Analytical Techniques

- FTIR/NIR spectroscopy
- UV/Visible reflectance spectroscopy
- Multispectral imaging
- Mechanical testing
- pXRF
- [Chemical (spot) tests]

Analytical Techniques

Use in combination:

- pXRF + FTIR
- pXRF + NIR

} Material Characterisation

- pXRF + UV/Vis
- pXRF + VRS (MuSIS)

} Pigment Characterisation

Challenges

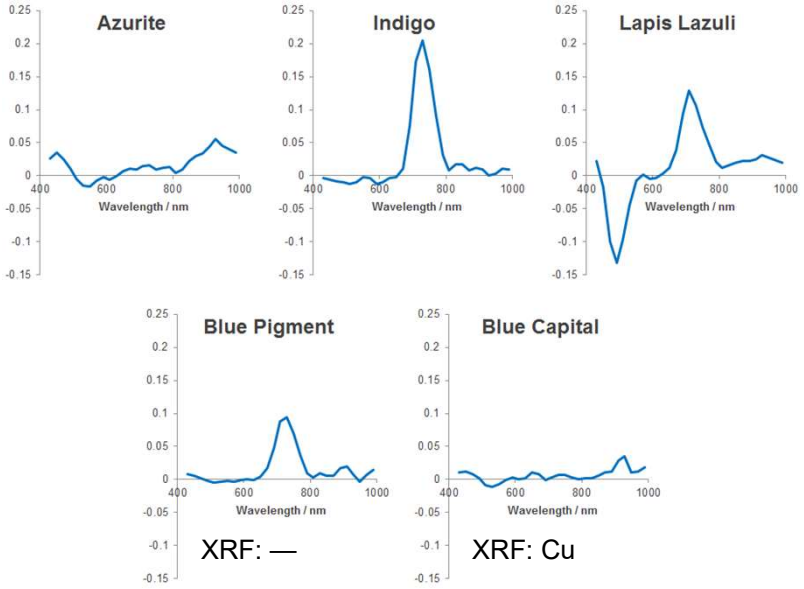
- Small regions of interest compared to spot size
- Overlapping pigments
- Mixtures
- Inhomogeneities
- Irregularly shaped/fragile objects
- No sampling permitted

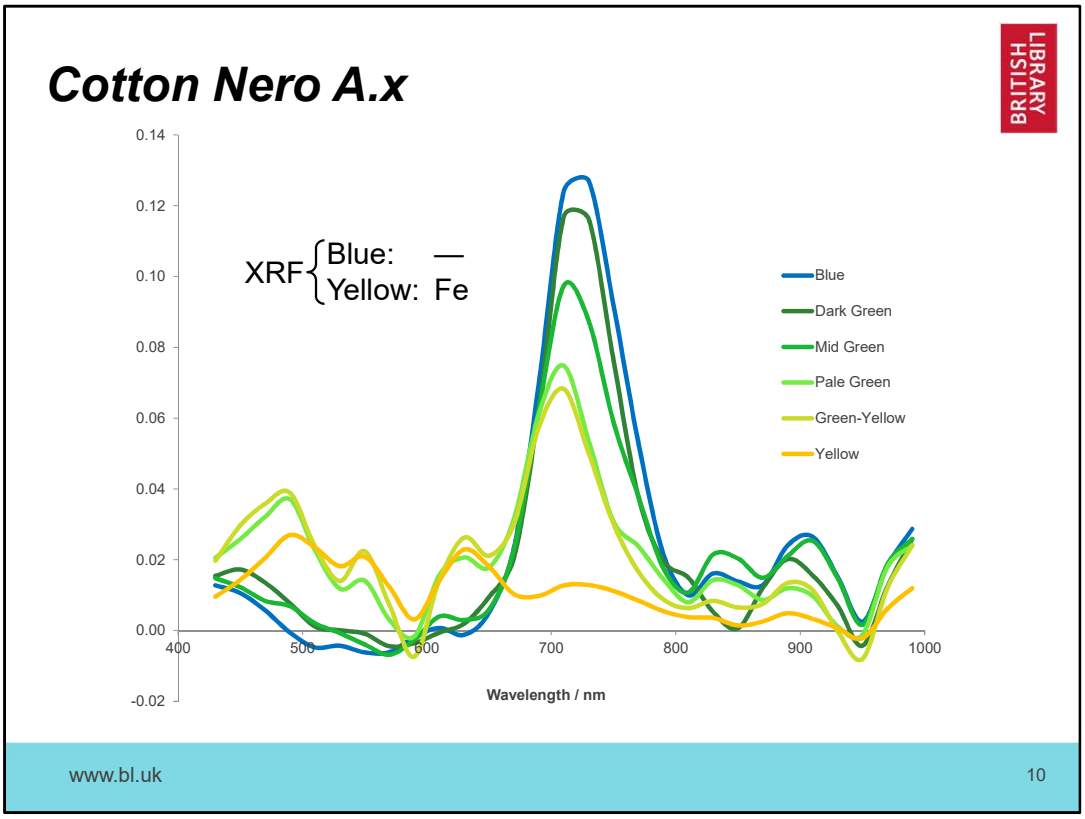
Cotton Nero A.x

- The Pearl / Gawain and the Green Knight
- 14th Century
- Several full page illustrations
- Pigments assessed by pXRF and VRS

Cotton Nero A.x

Cotton Nero A.x




Cotton Nero A.x
BRITISH LIBRARY
XRF
Blue: —
Yellow: Fe
Blue
Dark Green
Mid Green
Pale Green
Green-Yellow
Yellow
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
-0.02
400
500
600
700
800
900
1000
Wavelength / nm
www.bl.uk
10

Cotton Nero A.x

Pigment	XRF	VRS	Identity
Red	Hg	[Vermillion]	Vermillion
Yellow	Fe	[Earth Pigment]	Yellow Ochre
Blue	—	Indigo	Indigo
	Cu	Azurite	Azurite
Ochre/Brown	Fe	Earth Pigment	Sienna
Green	Fe	Indigo	Yellow Ochre + Indigo
Ink	Fe		Iron Gall Ink

Metal Foils (*RB.23.a.4296*, *OR.16967*)

- Metal foils on endpapers (*RB.23.a.4296*) and as embossed 'gilding' (*OR.16967*).
- Both assessed by pXRF
- Identified as brass
- *RB.23.a.4296*: Cu: 95%, Zn: 5%
- *OR.16967*: Cu: 92%, Zn: 8%

Kodisk

Steel?

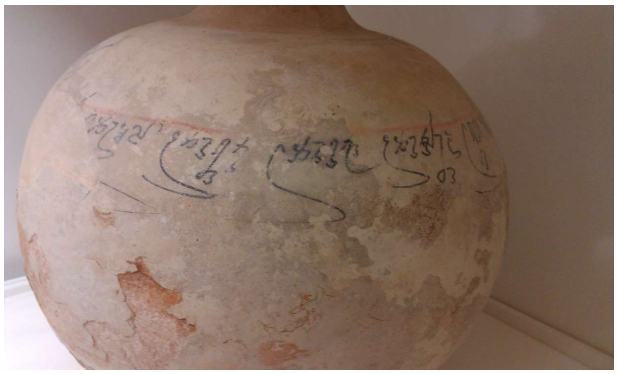
Aluminium?

Zinc?

Kharoṣṭhī Pots

- Buddhist texts
- 3rd century BC to 4th century AD
- Probably from Jalalabad region

Kharoṣṭhī Pots



- Efflorescence of crystalline ‘whiskers’
- Assessed by pXRF and FTIR
- Thecotrichite [$(Ca_3(CH_3CO_2)_3Cl(NO_3)_2 \cdot 7H_2O]$

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Summary and Conclusion

- The use of pXRF, even at a fairly simple level, allows a range of materials to be characterised and identified.
- This can inform both scholarship and conservation decisions.
- The technique can usefully be combined with other analytical techniques, such as FTIR, NIR and UV/Visible spectroscopy.