Non invasive analyses on drawings by Andrea Palladio and Vincenzo Scamozzi

about inks and technique in architectural drawings

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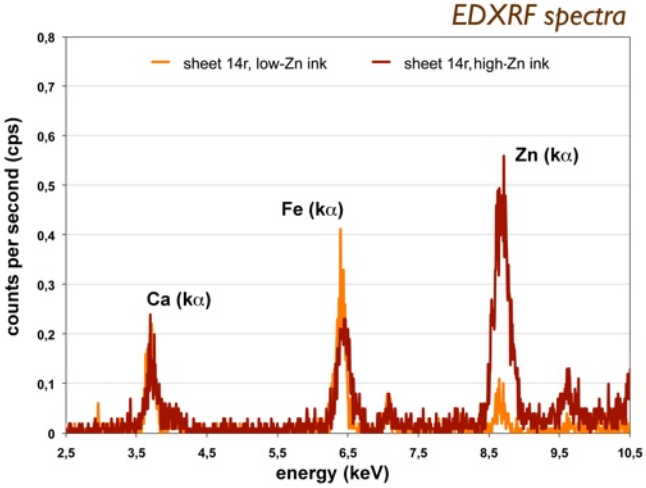
INTRODUCTION

A large campaign of non invasive analyses, both imaging – like transmitted light, infrared reflectography (IRR), ultraviolet fluorescence (UVF) – and spectroscopic – like X-ray fluorescence (ED-XRF), reflectance spectrometry in the visible range (vis-RS) and colorimetry – has been carried on over some drawings of the 16th century Italian architects Andrea Palladio (1508-1580) and his follower Vincenzo Scamozzi (1548-1616). The aim was to improve our knowledge of their drawing techniques and materials as well as provide information about conservative conditions. All the analyses were performed *in situ* with portable instrument, in order to avoid any kind of stress to the precious and delicate artefacts.

METERIALS & METHODS

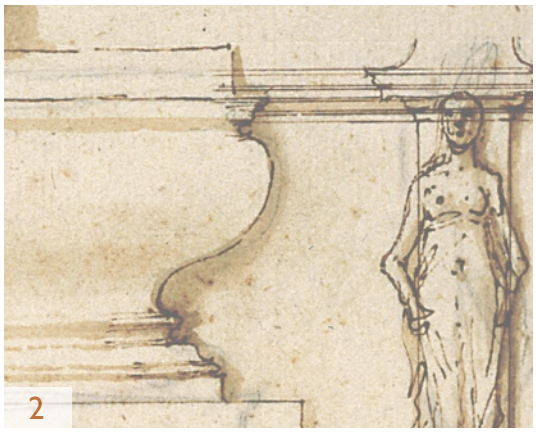
Macro and micro photograph: Nikon D2X digital camera. **IR reflectography**: CCD camera (IR range 0.85-1 micron, res. >10 pixel/mm). **ED-XRF**: portable spectrometers with Si-PIN detector; *on Palladio*: Assing LITHOS 3000, with monochromatic emission at Mo K-alfa energy (17.4 keV, Zr filter). *On Scamozzi* (see fig. 1): Niton Xlt 797X (Au anode, Mo target, 40 kV, 35 μA). **Vis-RS & colorimetry**: Minolta 2600d spectrophotometer (spectral range 360-740 nm, spectral resolution 10 nm) with internal integrating sphere (56 mm diameter), d/8 geometry.

About **Palladio**, the whole corpus of 33 sheets belonging to the Musei civici of Vicenza (Italy) was taken into account, investigating watermarks and main features. On the basis of these preliminary studies, we chose to examine deeply 11 sheets in order to recognise the materials he (and his collaborators) employed, like different types of points and metal-tannic inks (iron-gall).
Small amounts of Fe, Zn and Pb, together with Ca, are typical of the paper used in each sheet, with traces of K, Mn and Ag. Higher counts of iron characterise inks, sometimes also of zinc. We must point out that the amount of Zn measured in the paper sometimes appears to be higher than that measured on the inks of the same sheet: this can mean that the paper support is inhomogeneous, that sheets can be dirty and "polluted" by use, and that anyway is better to acquire a large set of data in order to apply statistical methods.
In some cases, the detection by XRF of different components (i.e. considering the Fe/Zn ratio) into the iron-gall inks used among different sheets or between the *recto* and the *verso* of the same drawing suggested different periods of execution, or that the author elaborated new solutions after a certain lapse of time. The need for different stylistic solutions emerges clearly from the habit of the author to apply papers with new capitals over other capitals in some sheets (**fig. 5b**) meaning these



4. Two different ink on sheet D14r and the EDXRF spectra: the darker is a low-Zn ink,and the lighter is the high-Zn ink.


1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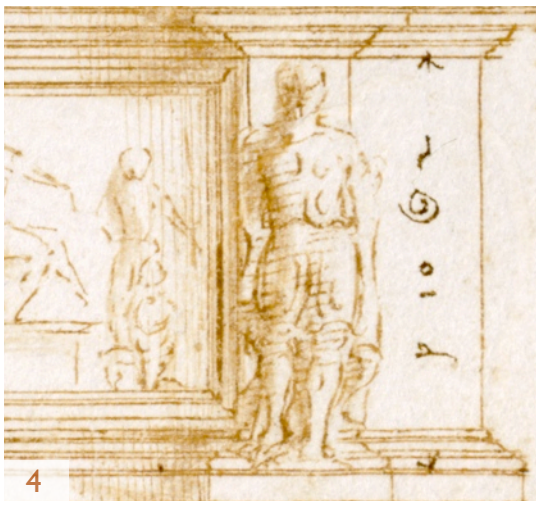
2. Palladio, detail of sheet D17r
3. Palladio, detail of sheet D21r


3


4

elements were restudied and refined.
The insignificant signal of Zn in many inks, and consequently the presence Fe as the only characteristic element forced us to try **a new method to compare Fe inks**, using colorimetric data in order to create some reference clusters to compare Fe amounts in the qualitative XRF analyses.
Thin grey lines (**fig. 2 and 3**) sometimes can be seen, related to a freehand drawing: the absence of significant elements in XRF suggests a black chalk or a thin carbonaceous point.
In raking light thin lines can be seen under architectural elements, probably impressed with an ivory stylus using a ruler, or with a metal compass.

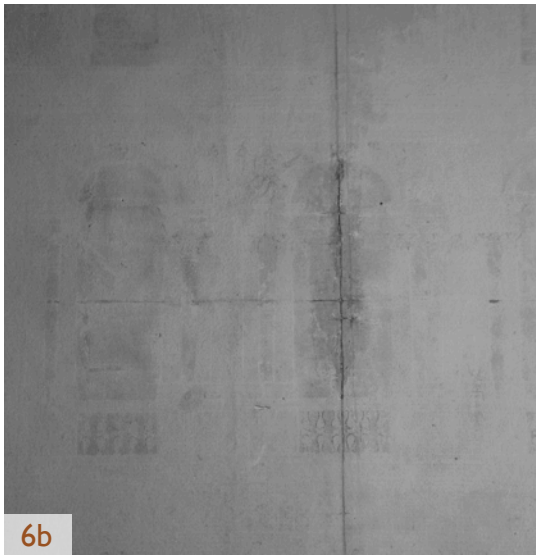
About **Scamozzi**, Palladio's heir, the few architectural drawings kept in the Biblioteca Civica Angelo Mai of Bergamo and in the Musei civici of Vicenza were studied, as well as the important *Taccuino di viaggio* (*Travel notebook*) he compiled during his journey from Paris back to Venice in the year 1600, full of notes and drawings of buildings he found on his way.
In the *Taccuino* analyses show Scamozzi used mainly an iron-gall ink rich in zinc and partly of copper (called "ink 1" type) - different within these aspects from Palladio's one - and that he changed ink only in the last days of his journey (from page 55), probably having finished the stock or the materials he brought with him (from Italy?). When his ink changes, almost only iron can be found by XRF ("ink 2" type), larger problems inherent ink corrosion become evident and ink spreading in the paper together with a higher absorption from *recto* to *verso* strongly arise.
The fact "ink 2" is also used in some corroded drawings before page 55 can mean he completed some drawings after or towards the end of the journey, perhaps using sketches on separate sheets. Drawings of the *Taccuino*, also if accurate, don't show underdrawing nor incisions.
The presence of Zn (with a constant ratio Fe/Zn) can be explained with the use of zinc sulphate in the ink recipe or with an ink obtained from a Zn rich ochre. Because Zn appears together with Cu (but with a quite inconstant ratio) perhaps a Fe sulphate ("copperas", from "marcasite") rich in Zn and Cu was used.
IR reflectograms show the ink is generally not particularly transparent to IR radiation; this can mean some carbon black is mixed with the metal-gall ink.
In the *architectural drawings* we studied - the projects for the *Palazzo del Podestà* of Vicenza (1610) and for the *Palazzo Nuovo* in Bergamo (1611) - brown inks are rich in Fe, generally without Zn. Perhaps no significant amounts of carbonaceous medium are used, as high IR transparency suggests.


5a

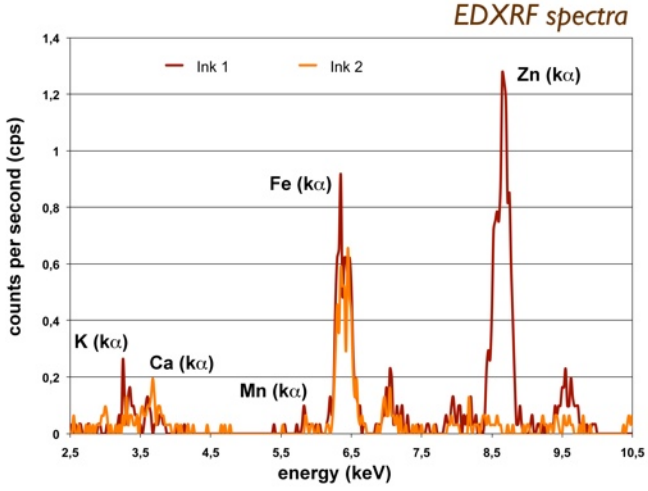
5.a-b *Palladio, detail of sheet D I 3r: original capital and over-applied one*


5b

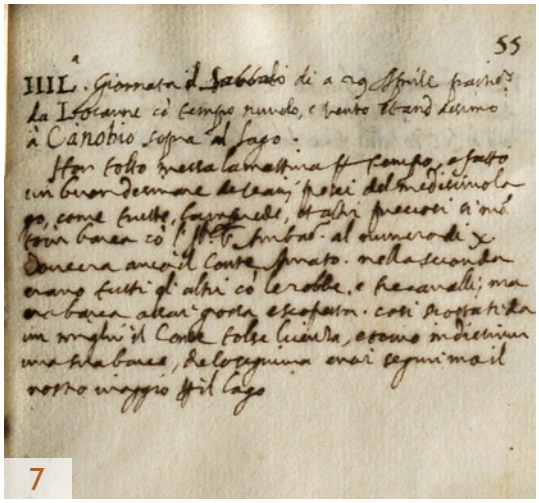

6a


6b

6.a-b *Vincenzo Scamozzi, Elevation of the front of "Palazzo Nuovo" of Bergamo, Bergamo. Visible and IR detail. Reflectography helps to visualise damages and retouches, while original ink disappears in NIR short bands*



7. *Scamozzi's Taccuino di viaggio. Detail of page 55 with the change of ink from a gallo-tannate rich in Fe and Zn (first 3 lines and "ink 1" in graph 2) to a gallo-tannate rich only in Fe (from line 4 and "ink 2" in graph 2). The new ink shows a characteristic spreading and appears to be more corrosive.*



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