

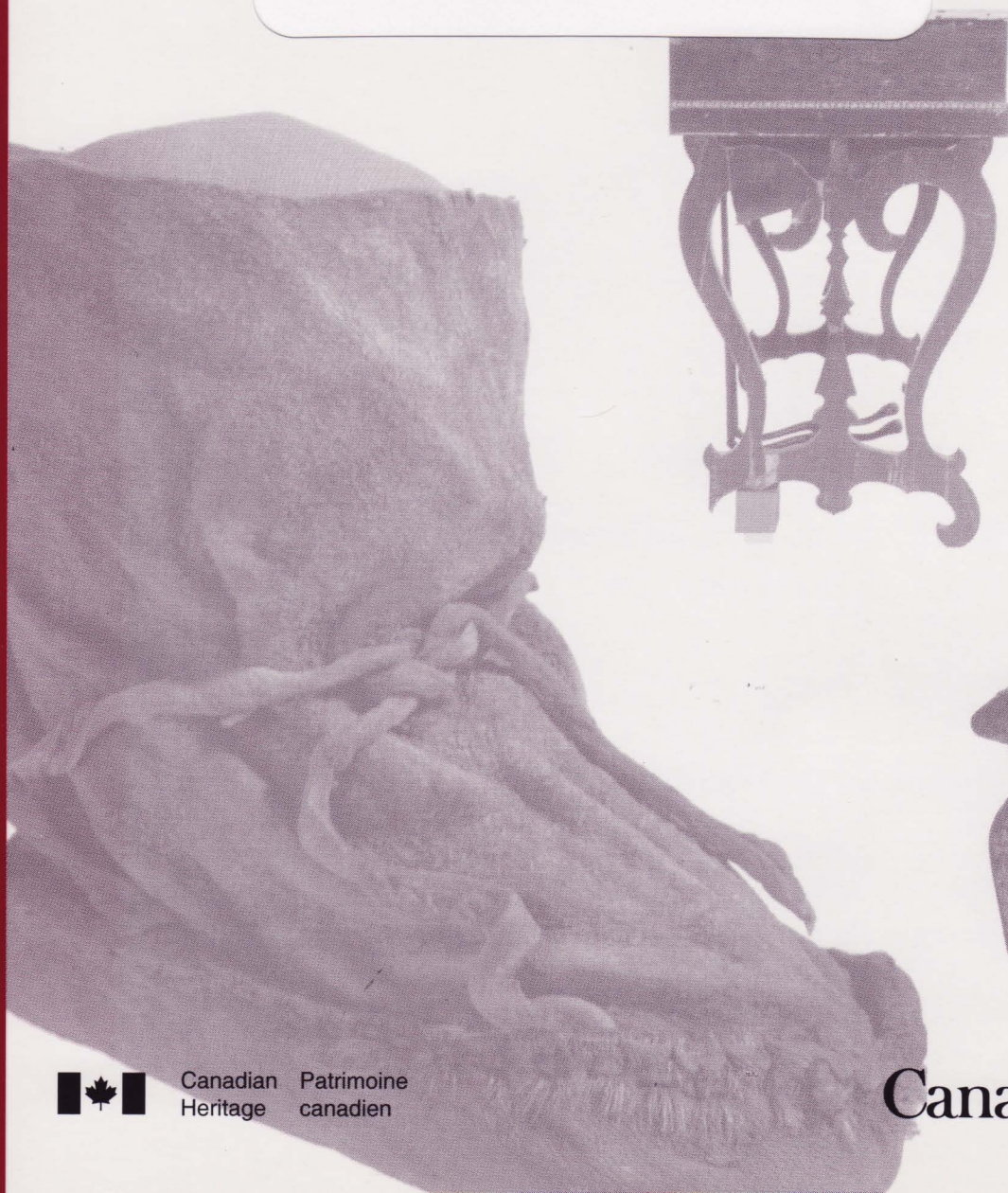
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Scientific Examination of the Sanders Portrait of William Shakespeare



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Scientific Examination of the Sanders Portrait of William Shakespeare

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Introduction

A panel painting, known as the Sanders Portrait of William Shakespeare, was examined. The portrait is the bust of a man thought to be Shakespeare. The date 1603 ("AN ° 1603") is painted in red in the upper right corner. A paper label glued to the back of the panel bears an inscription that is very difficult to make out, but which was deciphered by M. H. Spielmann who reported the content of the inscription in an article published in 1909.¹ The label identifies Shakespeare as the subject, gives his dates of birth and death, and specifies that the portrait was done when Shakespeare was 39 years old.

This painting was radiographed at the Canadian Conservation Institute in 1995 and dendrochronology of the wood panel was performed by Dr. Peter Klein, Universität Hamburg, in 1994. The panel is made of two boards, which have been identified as oak originating from the Baltic/Polish region. Dr. Klein's dendrochronological analysis of the wood indicated that the earliest possible date for the execution of the painting was 1597, and that a date of execution from 1603 onward was plausible.

Further examination of the painting was undertaken to document the materials and technique in order to determine if the paint materials and the paper label were contemporary with the wood panel.

Methods of Analysis

The painting was documented using ultraviolet-induced colour fluorescence photography, infrared photography, and infrared reflectography. The paper label glued to the back of the panel was documented using infrared photography and infrared reflectography. Digital image processing was used in an attempt to enhance the writing on the label.

Several areas of the painting were analysed non-destructively by radioisotope-excited x-ray energy spectrometry (REXES) using an americium-241 radioisotope. With this method, it is possible, without removing samples, to determine the presence at the percent level of elements of atomic number 19 (potassium) and higher.

Microscopic paint samples were taken from several locations listed in Table 1. The samples were analysed using one or several of the following techniques: scanning electron microscopy/x-ray energy spectrometry (SEM/XES), x-ray diffraction (XRD),

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Fourier transform infrared (FTIR) spectroscopy, and polarized light microscopy (PLM). Two samples were prepared as cross-sections by embedding them in polyester resin and preparing them using standard grinding and polishing techniques. The cross-sections were examined by light and fluorescence microscopy and analysed by SEM/XES. Staining tests were performed on the cross-sections with amido black, a stain used for protein.²

The paper of the label was analyzed by FTIR spectroscopy and examined by light microscopy. A sample of the paper was submitted to IsoTrace Radiocarbon Laboratory (University of Toronto) for radiocarbon dating.

Results

Photographic documentation of the painting is attached as an appendix. The results of the analyses are given in Table 2.

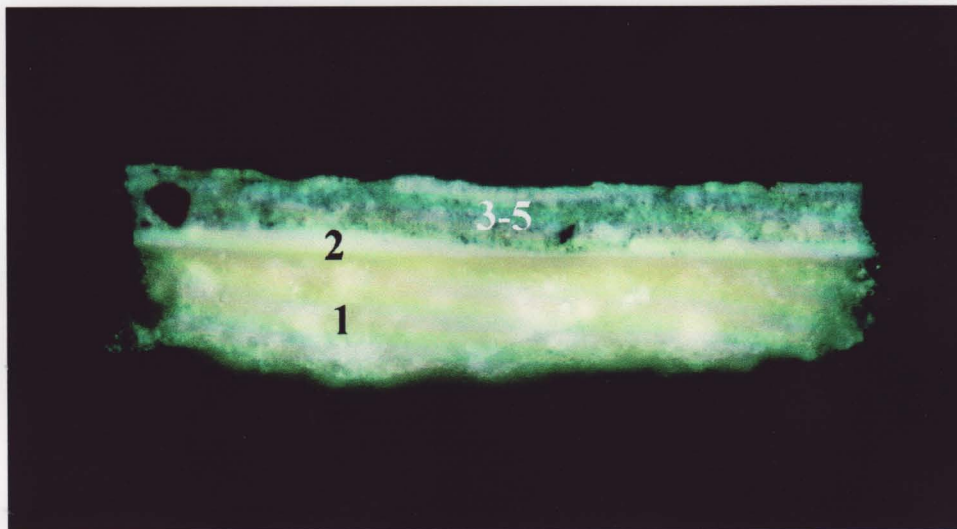
Painting Materials and Technique

The ultraviolet-induced colour fluorescence transparency showed a number of small retouches, appearing as grey and black areas. There was no indication that the collar and pourpoint have been modified or retouched, as suggested by Spielmann.¹ However, strong fluorescence from the varnish lowered the contrast between retouches and original paint. No underdrawing was observed using infrared photography or infrared reflectography.

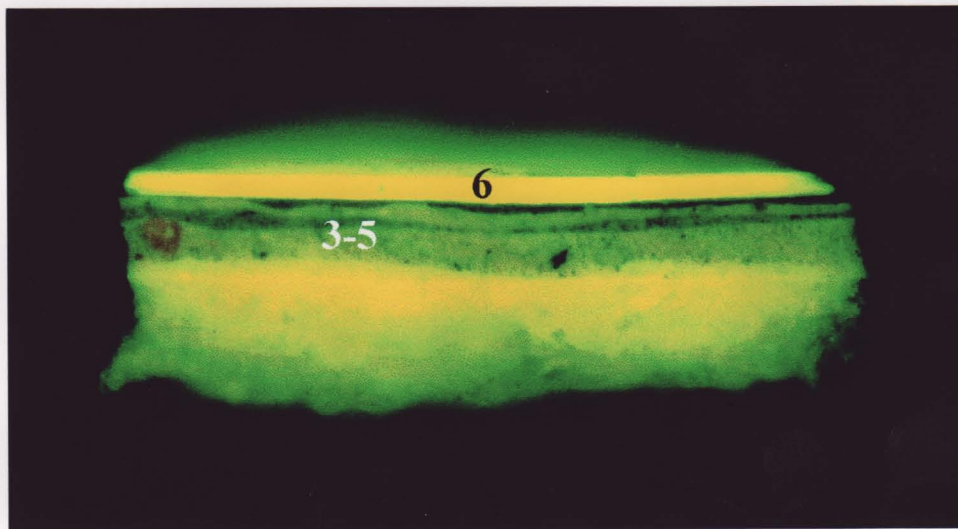
Paint samples were removed using the ultraviolet-induced colour fluorescence transparency as a guide to avoid as much as possible sampling non-original paint. The first two samples were prepared as cross-sections to reveal paint layers all the way down to the wood panel. As observed in the cross-sections (Figures 1 and 2), the wood was first covered with a white ground consisting of calcium carbonate. The ground was then covered with a white layer (imprimatura) containing lead white and calcium carbonate. The staining test with amido black gave a positive result for the ground and a negative result for the layer above it. This indicates that the ground is a glue ground and the layer above, an oil paint layer.

The following pigments were identified in the paint layers: charcoal black, a red lake, cinnabar (or vermilion obtained by sublimation), and orpiment. Charcoal black, a black pigment with a blue hue, was used mixed with lead white and a red lake to produce the colour of the pourpoint; this combination of pigments was used to produce a purple colour. The lighter colour of the collar was achieved by using small amounts of charcoal black in lead white. The pourpoint and collar appear greenish today probably because the painting is covered with a yellowed varnish; the superimposition of yellow and purple or blueish grey is responsible for the greenish tint. The cross-section taken from the pourpoint (Figure 1) reveals, on the white imprimatura, the layer of purple containing charcoal black, red lake and lead white, on top of which another thin, grey layer is found, followed by a thin, pale

grey layer. The various layers are easier to distinguish when the sample is viewed under ultraviolet illumination (Figure 1b). The thin layers likely correspond to the delicate lines painted over the purple background to render the embroidery on the pourpoint.



(a)



(b)

Figure 1: Photomicrograph of a cross-section from the pourpoint viewed (a) in reflected light, (b) under UV illumination. Layer sequence: 1- glue ground; 2- white imprimatura; 3 to 5- grey paint; 6- varnish.

The red paint used to paint the date is composed of a mixture of cinnabar (or vermilion obtained by sublimation) and orpiment; cinnabar was also used to paint the lips. There is no indication that the red paint of the date is a later addition. As can be seen in the cross-section (Figure 2), the red paint is directly applied on the brown paint of the background; no varnish or dirt layer was observed between the brown paint and the red paint. Lead and iron were detected in the brown paint of the background, indicating that lead white and iron oxide pigments such as ochres and earth pigments were used.

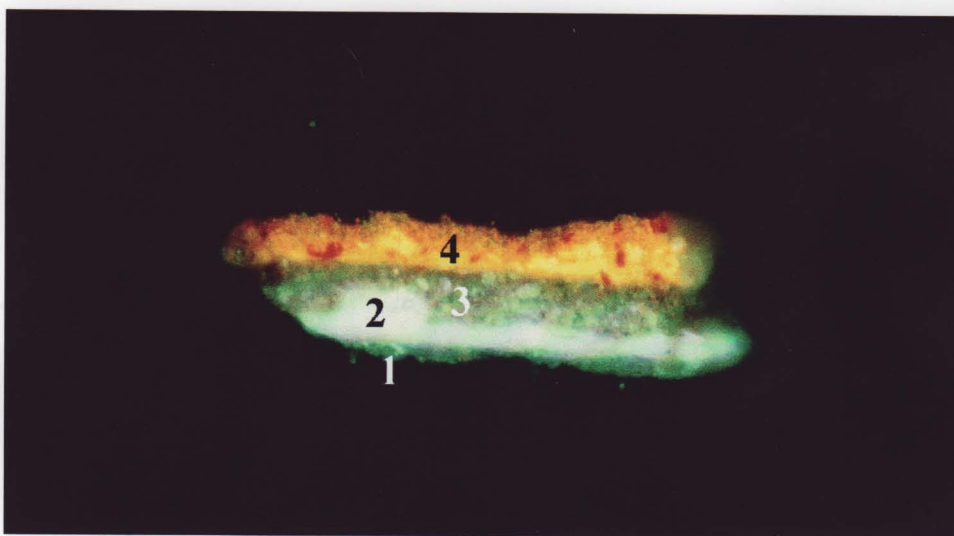


Figure 2: Photomicrograph of a cross-section from the date (“AN ° 1603”), viewed in reflected light. Layer sequence: 1- glue ground (partial); 2- white imprimatura; 3- brown paint; 4- red paint.

Paper label

No improvement in the legibility of the inscription on the paper label glued to the back of the panel was achieved using infrared photography or reflectography, even after computer enhancement of the image.

The paper of the label was identified as rag paper, made from linen. Starch was identified by FTIR spectroscopy on one side of a sample of the paper, indicating that the paper label was glued onto the wood panel with starch paste. The date of the paper was determined by the IsoTrace Radiocarbon Laboratory to lie within the range of 1475 AD–1640 AD.³



Discussion

The oak panel was prepared with a calcium carbonate and glue ground, on which a thin layer consisting of lead white and calcium carbonate in oil was applied. The calcium carbonate and glue ground was typically used by painters of the Northern School (which includes England) when painting on panel. According to Bergeon, the insertion of a second white ground (or *imprimatura*) made of oil and lead white between the first glue ground and the coloured layer of the painting is a practice that started in the 16th century.⁴

All pigments identified are traditional pigments. Cinnabar (or vermilion obtained by sublimation), and orpiment have been used since antiquity, and are still in use today.^{5,6} The mixture of charcoal black, red lake, and lead white used to paint the pourpoint was commonly used in the late 16th-early 17th centuries to give purples and mauves. Artists such as Rubens and van Dyck made extensive use of that mixture.⁷

There is no indication that the red paint of the date is a later addition, as suggested by Spielmann.¹ The red paint is applied directly on the brown paint of the background; no varnish or dirt layer was observed between the brown paint and the red paint.

The paper of the label glued to the back of the panel was found to date in the range 1475 AD to 1640 AD. This indicates that the label was probably applied to the panel between the time it was painted and about forty years later, assuming the painting was executed in 1603.

Conclusion

The materials and techniques of the panel painting known as the Sanders Portrait of William Shakespeare are consistent with the date of 1603 painted in the top right corner, as is the dating of the wood panel on which it is painted, as established by Dr. Peter Klein. The dating of the paper label glued to the back of the panel, which identifies Shakespeare as the subject of the painting, indicates that the label was probably applied to the panel between the time it was painted and about forty years later, assuming the painting was executed in 1603.

References

- 1- Spielmann, M. H., "The 'Grafton' and 'Sanders' Portraits of Shakespeare," *The Connoisseur*, vol. 23, January-April 1909, pp. 97-102.
- 2- Martin, Elisabeth, "Some Improvements in Techniques of Analysis of Paint Media," *Studies in Conservation*, vol. 22, 1977, pp. 63-67.



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- 3- Beukens, Roelf P., *Radiocarbon Analysis Report*, August 1, 2000.
- 4- Bergeon, Ségolène, "Painting Technique: Priming, Coloured Paint Film and Varnish," *PACT*, vol. 13, 1986, pp. 35-62.
- 5- Gettens, Rutherford J., Feller, Robert L. and Chase, W.T., "Vermilion and Cinnabar," in: *Artists' Pigments: A Handbook of their History and Characteristics*, vol. 2, Ashok Roy, editor (Washington: National Gallery of Art, 1993), pp. 159-182.
- 6- FitzHugh, Elisabeth West, "Orpiment and Realgar," in: *Artists' Pigments: A Handbook of their History and Characteristics*, vol. 3, Elisabeth West FitzHugh, editor (Washington: National Gallery of Art, 1997), pp. 47-79.
- 7- Kirby, Jo, "The Painters' Trade in the Seventeenth Century: Theory and Practice," *National Gallery Technical Bulletin*, vol. 20, 1999, pp. 5-49.

**Table 1: Sample Descriptions and Locations**

| Sample No. | Description | Location* (cm) |
|------------|---|------------------|
| 1 | grey-green from pourpoint | right edge, 8.3 |
| 2 | red from number "3" in the date | right edge, 40.2 |
| 3 | grey-green from collar, proper right | 10.8, 12.0 |
| 4 | red from lips | 17.3, 20.9 |
| 5 | paper from label glued to the back of the panel | |

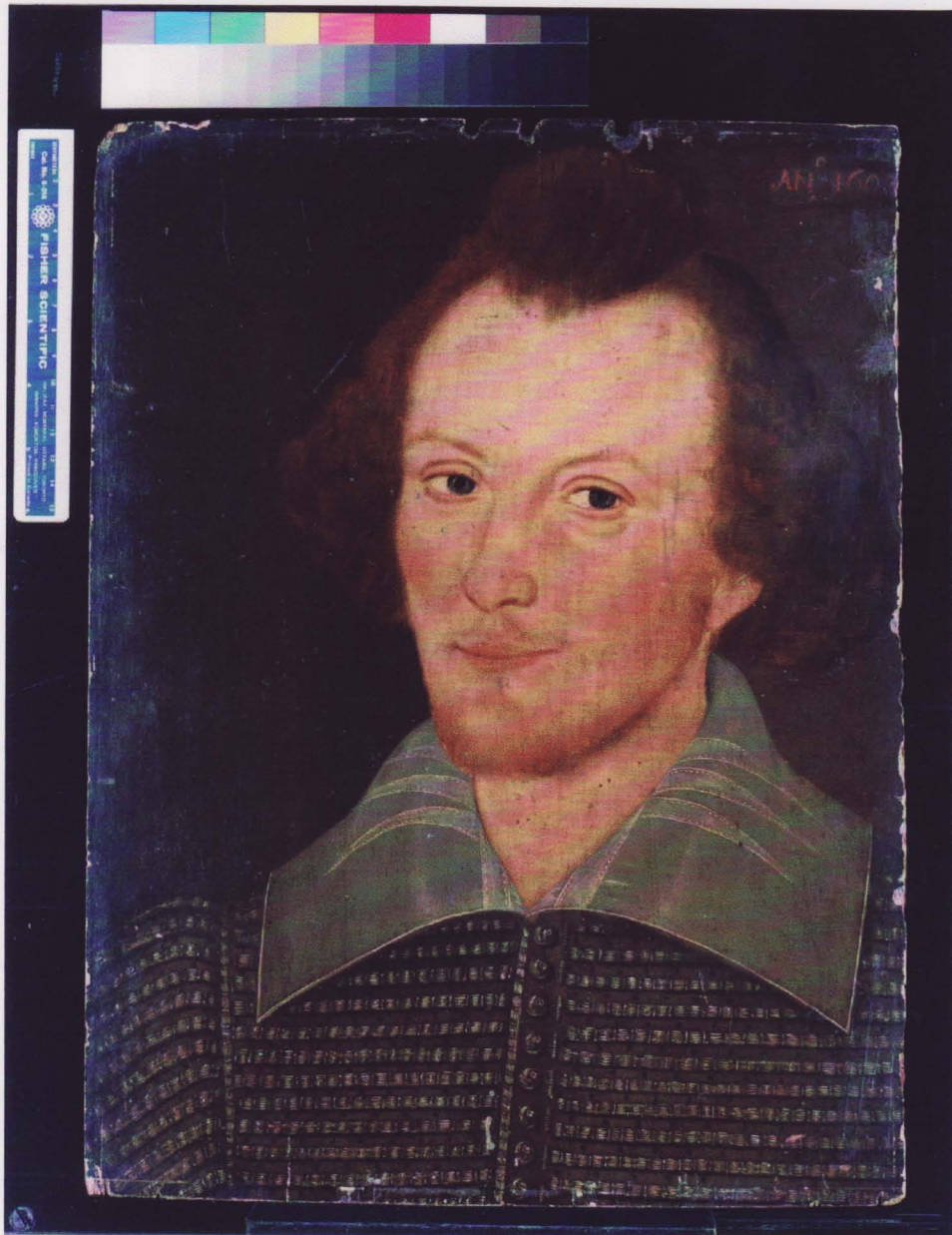
*Expressed as x, y coordinates, the origin being the bottom left corner of the painting

**Table 2: Results of the Analysis**

| Sample No. | Elements detected | Compounds identified |
|--|--|--|
| 1- grey-green, pourpoint varnish (2 layers) dark layer (thin, uneven, probably grime) pale grey layer (thin) grey layer (thin) grey layer white imprimatura white ground | Pb Pb (Ca) Pb (Fe, Al, Ca) Pb , Ca Ca | charcoal black, red lake, quartz |
| 2- red from number "3" varnish (3 layers) dark layer (thin, uneven, probably grime) red layer brown layer white imprimatura white ground (partial) | Hg/S , Ca, As (Al, K) Pb/S , Fe (Ca) Pb , Ca Ca | cinnabar (or dry process vermilion), orpiment |
| 3- grey-green, collar, proper right | | trace of charcoal black |
| 4- red from lips | | vermilion (dry process or cinnabar) |

*Elements in bold are present in high amounts, those in normal typeface in medium amounts and those in parenthesis in low amounts

Appendix: Photographic Documentation



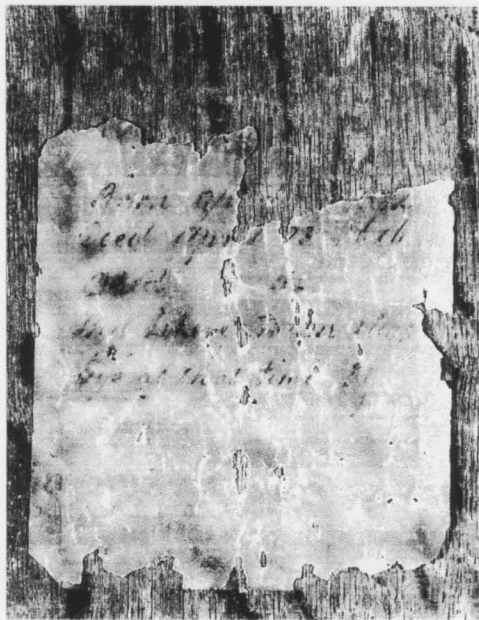
The Sanders Portrait of William Shakespeare, color print.



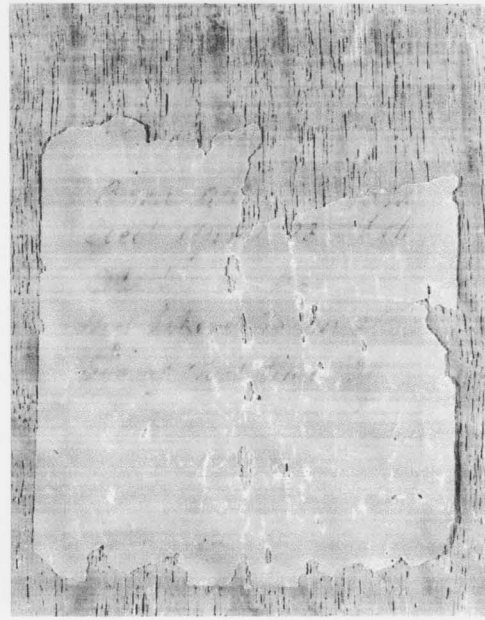
The Sanders Portrait of William Shakespeare, ultraviolet-induced color fluorescence photography, color print.



(a)



(b)



(c)

Paper label: (a) black and white print; (b) and (c) digitally-modified black and white prints.

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