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7 December 1995

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CANADA

Mon Cher Mon. Boka:

I am enclosing a write-up on your Rembrandt/Cuyp painting "The Adoration of the Shepherds."

### **Scientific Evidence in an Authentication Study of "The Adoration of the Shepherds" by Rembrandt/Cuyp**

An artist produces a painting using materials (pigments, media and support) available at that time and in his locale. New pigments and, to a lesser extent, media and supports, are discovered, invented or produced on a continuing basis. Many were available to the ancients, some were invented by alchemists in the first millennium, and many, many more during the past 500 years. Paint media and supports have changed much less frequently than pigments during the past 1000 years. Drying oils as a paint medium date from, at least, the fifth century A.D. although not used extensively until the 15th Century. Gums, such as gum arabic, and tempera have much earlier B.C. dates; wax in encaustic paintings, was popular in ancient Egypt. Supports for paintings began with cave walls, followed by walls of buildings. By the first century B.C., paintings were produced on cloth, paper, cardboard, wood, metals, and during the 20th century, masonite, glass and plastics. One could perhaps include skins (parchment or leather) either flayed from an animal or live skin for tattoos.

These changes in materials led to dating procedures with accuracies increasingly more precise as time progressed. Table 1 lists a few pigments with their dates of first use (1). Pigments are readily identified by polarized light microscopy. The particle size, shape, and optical properties form a set of identifying characteristics that uniquely identify each pigment. The samples required from different color areas of a painting, taken with an ultra-sharp needle, are usually smaller than the period at the end of this sentence. The background and experience needed to do pigment sampling and identification (2)

are best obtained in the one-week courses taught at the McCrone Research Institute in Chicago. Staining reactions and other techniques for the identification of paint media and supports are also included in those courses.

**Table 1. Dates of First Use For Paint Pigments\***

<u>Pigment</u>	<u>First Use</u>
orpiment	ancient
red ochre	ancient
smalt	1550
van dyke brown	1690
prussian blue	1704
alizarin	1830
zinc white	1850
titanium white	1920
manganese blue	1950

\*A more complete list is given in *The Microscope* (1994) 42:3, 111-120

The fibers used in cloth and paper as supports for paintings have a similar set of dates of first use (Table 2).

**Table 2. Paper Dating**

Papyrus	3600 B.C.
rags (cotton and linen)	From earliest times
straw	1800
groundwood	after 1869
soda wood pulp	after 1856
esparto with rag	after 1857
sulfite woodpulp	after 1872
bagasse	after 1884
esparto with chemical wood pulp	after 1890
cotton linters	after 1920
bamboo	after 1930 (India)
alpha woodpulp	after 1933
rayon	1936
chemical hardwood pulp	1950
glass fibers	1950

In addition to the use of polarized light microscopy to identify the substances in Tables 1-2 there are other techniques for characterizing paintings as an aid in authentication. Carbon-dating may be helpful for wood, paper or canvas. It is not, however, very accurate (usually  $\pm 50-75$  years) except for post-1955 dates when the error may be only  $\pm 1-2$  years. This is related to the rapid changes in carbon isotope ratios resulting from atmospheric testing of nuclear devices during the 1954-1964 decade.

Dendrochronology may sometimes be used. Josef Bauch in the Netherlands has done an excellent job of dating tree-rings of Dutch oak panels back to at least 1000 A.D. Some other species and locations are also possible. Accuracy of + 5 years is possible if, at least, a few pulp-wood rings are visible on the panel. This then, is far better than carbon dating for pre-1955 panels and dendrochronology has been used to calibrate (correct) carbon-dating data.

X-ray radiology is also a valuable tool to help understand the structure of a painting. Based on the fact that pigments differ in their absorption of x-rays, patterns of dark and light areas delineate the areas occupied by different pigments. Pigments containing heavy elements like lead and mercury strongly absorb x-rays and those areas of an x-ray film will be lighter. Lighter elements yield darker areas because more x-rays are transmitted to darken the film. This differential effect helps in identifying pigments but its most important use is in revealing alterations in the painting image composition, e.g., a change in position of a hand. Earlier images often become visible by x-ray radiology.

Other useful scientific tests involve the use of infrared and ultraviolet light examination. Paint layers are more transparent to infrared light and help to reveal an artist's underdrawing (pentimento). Ultraviolet light causes fluorescence of the various pigments, media and varnish in each area of a painting. It is used principally to reveal restoration areas that fluoresce differently from surrounding areas.

Not very often are all of these techniques applied to a given painting. They are, however, available as needed. The 27 x 33 cm oil painting on a wood panel "The Adoration of the Shepherds" showing the infant Jesus in a Nativity scene has been studied scientifically. Unfortunately, dendrochronology could not be used because the wood panel is mahogany for which no calibration data are available. The age (about 1630) was confirmed by identification of the pigments using the polarized light microscope.

Our first examination (seven different samples) showed a variety of pigments available during Rembrandt's and Cuyp's lifetime (burnt sienna, copper resinate, lead

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white, charcoal, vermilion, red ochre and yellow ochre). However, one area in the upper right showed the presence of prussian blue, available only from the early 18th century. On this basis, we withheld our conclusion that the painting could have been painted during Rembrandt or Cuyp's lifetime.

At Mon. Boka's request, the painting was re-examined taking additional samples from four different areas of a color similar to that in which we had found prussian blue. In these new samples no prussian blue was found, only pigments available throughout the 17th century. The prussian blue in the upper right is therefore a later addition resulting from restoration. The absence of many pigments of later date is also important evidence for a date consistent with Rembrandt's and Cuyp's lifetime.

Science, alone, cannot, of course, tell who painted this picture, but only that it was painted early in the 17th century. It does, however, eliminate an important obstacle to acceptance of that attribution.

While the above evidence strongly suggests the attribution of the 11" x 13" painting to Rembrandt/Cuyp as predicted by Mr. Boka, there is still an unanswered question—whether Benjamin Gerritz Cuyp (1612-1652) should be included in the school of Rembrandt. This Nativity scene could, perhaps, be the living proof that Benjamin Gerritz Cuyp was indeed a pupil of Rembrandt, probably for a short period of time around 1629-1630.

It is also significant that Dr. Valentiner writes in the introduction to the catalog for the exhibition "Rembrandt and his Pupils" (1956) on pg. 29 the following:

"On the one hand, we have no knowledge that Paulus Lesire and Benjamin Gerritz Cuyp both living in Dordrecht, were ever direct pupils of Rembrandt. However, their earliest style is so closely related to Rembrandt's Leyden epoch, that there must have been some direct or indirect connection with him".

We sometimes hear it said that all roads lead to Rome. In a similar vein, we can say that all of the scientific analyses made on "The Adoration of the Shepards" lead to the 17th century. Indirectly, as well, to Benjamin Gerritsz Cuyp according to the reconnaissance by, and attribution of, "The Adoration of the Shepard" to the little master of Dordrecht by Dr. Ildiko Ember, Chief Curator in the Szépművészeti Museum in Budapest.

No adverse evidence but much positive evidence has been found to place this painting in the 17th century. In particular, the materials in this painting, early pig-

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ments, media, and support were all available to Rembrandt van Rijn and to Benjamin Gerritsz Cuyp in 1629-1632.

It remains only for the art scholars and historians to consider the scientific evidence from Dr. Walter C. McCrone and the historical evidence developed by Dr. Ildiko Ember and Mon. Georges Boka. Hopefully, this careful research will lead to acceptance by the Art World of a newly discovered Rembrandt-Cuyp painting.

This extremely rare painting shows two different hands involved in its execution; different in the upper part and the bottom part. This was first recognized by Georges Boka in 1981. In February 1993, this was confirmed by Dr. Ildiko Ember. Georges Boka is no stranger to the study of Rembrandt. His studies cover more than 30 years culminating in 1994 with his book, "Night Watch." The painting of "The Adoration of the Shepards" may become the living and tangible proof of the presence of Benjamin Gerritsz Cuyp in the school of Rembrandt in Leyden or in Amsterdam around 1631 and 1632 according to Georges Boka.

I am pleased that the polarized light microscope and I, have eliminated the possibility of "The Adoration of the Shepards" as a post-17th century painting and helped point to Rembrandt and Benjamin Gerritsz Cuyp as the artists.

**References:**

1. McCrone, W.C. "A Scientific Study of Marcus Aurelius Between Philosophers" *Microscope* 1994, 42:3, 111-114.
2. McCrone, W.C. "The Microscopical Identification of Artist's Pigments" *J. IIC-CG* 1987, 7:1,2, 11-34.

Yours sincerely,

*Walter C. McCrone*

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