# Re-inventing Diddy
# The examination and treatment of a pastel drawing on paper by Grace Cossington Smith

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ABSTRACT

*Portrait of Diddy is a pastel and charcoal drawing on paper by the renowned Australian artist Grace Cossington Smith (1892-1984). The work dates from circa 1920 and is in the collection of the National Gallery of Australia (NGA). It has never been on display because of its fragile condition. An exhibition of the artist's work is to be held at the NGA in 2005 with this work being a significant highlight.*

*Research into the work has shed light on some interesting connections, notably the relationship between the sitter and the artist. The portrait features the artist's favourite younger sister, Charlotte, known to the family as 'Diddy'. Diddy was a recurring source of inspiration for her artist sister and appears frequently in Cossington Smith's oeuvre, particularly the extensive sketchbook collection of the NGA.*

*The tricky conservation treatment demanded a collaborative approach from the paper conservation team. This was supported by close discussion with the Curatorial department to outline treatment limitations and potential achievements. The paper support was severely degraded, corresponding to particular coloured areas of the image. Scientific collaboration with the University of Canberra was necessary to determine the complexity of the media layer on the paper before the exact cause of deterioration could be established. Initial investigations began in 1998 with analysis and treatment being carried out in 2003-04. This paper will discuss the relationship between artist*

*and sitter, outline analysis, research and the conservation treatment of this work.*

Grace Cossington Smith, *Portrait of Diddy,* c.1920. Before treatment in raking light (above), after treatment (below)

BACKGROUND

*Portrait of Diddy* was purchased by the NGA in 1970s and has remained un-exhibited since, due to the extreme fragility of the paper support. The paper conservation team began initial investigations into the work in 1998, under the supervision of Susie Bioletti, following a request from Curatorial staff to prepare it for display. Treatment was put on hold until further research could be carried out. The project recommenced during 2003.

CONDITION SUMMARY

The sheet measures 62.5 x 47.6 centimetres. The image is drawn in charcoal and a range of coloured pastels on paper. Charcoal is used to loosely delineate large areas, while the pastel has been worked in layers, often over the charcoal outlines, blocking in colour and highlighting detail. The pastel is applied in strongly directional vertical strokes, subtly blended and compacted on the surface of the support. Some smudging of the media was noted - a common problem with friable pastels, which may also be attributed to Cossington Smith's original technique. The paper is severely degraded, with localised areas of dark brown discolouration and wet-staining visible. It is extremely brittle in these stained areas. Regions of tight cockling on the edges and lower right quadrant of the support were an additional problem, thought to have been created as a result of contact with water. The localised degradation of the support particularly in areas of water damage, had caused tensions and fracturing in the paper. It is suspected that the portrait had been subjected to a hectic life. Numerous pinholes, some on the sides of the support but concentrated at the four corners, suggested that the work had been pinned up and relocated many times. It had also been mounted and framed, evidenced by the tell-tale brown, acid-induced staining in the margins on the front of the support, indicating a previous poor quality window mount.

It was initially assumed that the pattern of visible degradation on the back of the sheet would correlate strongly with the

application of certain pigments on the front. It was suspected that the orange and yellow pigments, present in degraded areas of the support, were responsible for the embrittlement and discolouration in the paper. However, on closer inspection, although the damage in the support conformed to some extent to areas where particular pigments had been applied, there was no consistency and it was concluded that the affected areas were not associated with one particular colour or colour combination. The extent of discolouration and embrittlement in the support was surprising, considering that the pastel medium used by the artist was expected to have been supplemented with substantial quantities of chalk (calcium carbonate). Typically, pastel mediums have a protective effect on paper. There was no obvious evidence or written record of previous conservation procedures, such as aggressive bleaching, which might have contributed to the accelerated ageing of the support.

Local repairs with Japanese paper had been previously undertaken to hold together fractures in the support running along the chain and laid lines in the paper. Small losses had occurred at the junction of various fractures. The repairs were found to be contributing to uneven stress in the support. In some areas of repair the pastel surface took on a burnished appearance, presumably as a result of excessive surface manipulation. There were two obvious areas of retouching. These were in the sitter's clothing and adjacent to her face, worked in a similar manner to the original and hiding degradation in the support. In these areas the pastel was compacted and burnished to the extent that it had begun to flake from the softer layers beneath. There is a black pastel/charcoal inscription "G. Cossington Smith" at the lower left in block capitals, approximately one centimetre high, partially erased and rewritten. Whether the inscription is by the artist or another hand is unknown. It may be a later addition.

## WHO WAS DIDDY?

Grace Cossington Smith is an Australian artist whose name is synonymous with colour and light. Drawing played an important role in her evolution as a colourist and a draughtswoman. The NGA owns 50 sketchbooks, containing over 1400 drawings, attesting to this fact. Cossington Smith's pastel drawings were produced at a relatively early stage in her career and were largely superseded around 1920 by colour pencil. The characteristic, intense heightened palette of Cossington Smith's oil paintings was often planned and ordered in her sketchbooks and drawings. Her sketchbooks become day-to-day diaries of written colour notes, with a huge variety of samples tested in the margins. Early works were signed *G. Smith*, but as her career developed the artist inserted *Cossington* at the suggestion of her mother, who had been born in the English town of that name. The family's two Sydney homes, first at Mosman and later at Turramurra, were also named *Cossington*.

*Portrait of Diddy* was created in Dattilo Rubbo's Sydney studio around 1920. But who was Diddy? Research into the work has shed light on some interesting connections, notably the relationship between the sitter and the artist. Charlotte, known to the family as Diddy, was the youngest and most beloved of Grace Cossington Smith's three sisters. She was a recurring source of inspiration for her artist sister and appeared frequently in Cossington Smith's oeuvre, particularly in the extensive sketchbook collection held by the NGA. She was an avid reader and a placid and co-operative sitter, whereas the other girls were given to sudden flight.

Diddy graduated in Sydney as a nurse circa 1922. She spent seven strenuous years nursing in the British Army, including field service in Burma during the 1939-45 War. She bought a motor car in 1951 and was able to intensify her collaboration with the artist by driving Grace on excursions into the bush. Diddy would take a chair and a book and contentedly relax whilst Grace sketched and painted. This rewarding partnership abruptly ended in 1953 when Diddy suffered a stroke. Grace

cared for her sister at home until she died in 1962.

Grace Cossington Smith exhibited works on paper less often than paintings, mostly early in her career. *Portrait of Diddy* is thought to have been one of the first exhibited works on paper. In his book, Bruce James (p.56,1990) proposes that it may have been the *Chalk Drawing* she submitted for the 1922 Royal Art Society Annual. He describes it as, 'A 'cross-over' work, a coloured, painterly drawing'. It has been suggested that she was exploring the pastel medium at a time when she was struggling to achieve the effects she wanted in her paintings (Thomas, p.19, 1993). She was attracted to pastel by its immediacy and the texture, wanting to achieve, as she did, a surface that was 'crumby' and 'dry'. The strongly directional nature of the media application in *Portrait of Diddy* is a prelude to the sophisticated effects Cossington Smith later achieved in her oil paintings with 'firm, separate notes of clear, unworried paint' (Sayers, p.516, 1987).

## Analysis and Results

Initial analysis involved examining the work in detail under low magnification, raking, ultra-violet (UV) and infra-red light. The information gleaned from the examination is detailed in the Condition Summary. Surprisingly, the UV examination yielded little, apart from highlighting the extreme oxidation of the paper support, apparent as patterns of strong absorption. There was no distinctive fluorescence from any of the pigments.

The localised degradation in *Portrait of Diddy* was suspected to be linked to the application of zinc white pigment and was consistent with other cases described in the conservation literature (Hey, 1987/88 and Daniels, 1990). When pigments containing zinc oxide are subjected to excessive light and moisture, a photochemical reaction can occur producing hydrogen peroxide (Daniels, p.102, 1996).

Grace Cossington Smith: *Portrait of Diddy* c.1920 Superimposed recto and verso, before treatment highlighting the relationship between the support degradation with pigment location

Grace Cossington Smith: *Portrait of Diddy* c.1920. Verso, before treatment in raking light

| | | | | |
|---|---|---|---|---|
| zinc oxide | + water | + | *radiation* → | hydrogen peroxide |

However the damage potentially could have been the result of any number of interactions between the paper, pigments, and binders. The effect of a previous secondary support, past treatment, storage and/or display environments could also not be discounted. The observations needed to be qualified with analysis.

### Russell Graph

A Russell Graph was carried out by Susie Bioletti in 1998 but yielded negative results. Russell Graphs can be used to detect the presence of peroxides, by recording their effect on silver ions in photographic film. The emulsion side of the film is placed in contact with the work, usually inside an airtight and light-tight Solander box and left for 24-72 hours. After exposure, the film is removed and developed using conventional methods. Modern films will not detect small amounts of peroxides, therefore film needs to be sensitised with ammonia to increase the film sensitivity. Photo-oxidation is a free radical process which produces hydrogen peroxide. Peroxide emission reduces silver ions in the photographic film to metallic silver which correspond to dark image areas when the film is developed (Daniels, 1984 and Jane Colburn, p.40, 2000).

### Analytical Equipment

More detailed analysis was undertaken on dispersed and mounted samples using polarised light microscopy for identification. This was followed by dispersive Raman micro-spectroscopy at the University of Canberra for confirmation of the PLM results and further elucidation of possible unknowns. Further analysis was ultimately carried out using SEM/EDX facilities at the Australian National University on two carbon-coated cross-sections.

The equipment used included a Leica DMLP microscope fitted with x10 – x63 flat field strain-free objectives and full polarising accessories and an Olympus BX60 microscope fitted with x10 – x100 flat field strain-free objectives and full polarising accessories. The Raman instrument was a Renishaw 2000 spectrophotometer linked to an Olympus BH2 microscope. Analysis was carried out using a near infra-red diode laser through a x50 objective.

### Paper

The paper was found to be medium weight and warm cream in tone, with distinct chain and laid lines and a 'Not' surface. Two deckle edges were evident on the long sides and two roughly cut edges at the top and bottom. This is consistent with machine mould-made paper, where two natural deckle edges are created by the mould and two are simulated by tearing. The watermark/countermark was parallel to each of the longer sides – 'MBM (FRANCE) INGRES D'ARCHES' on the right edge and simply 'MBM' on the left edge. The watermark/countermark derives from the initials of the original French based Arches paper mill owners, Morel and Bercioux (1860-61). Another partner Albert Masure joined the original owners in 1879 and his initial was added, resulting in the final "MBM" watermark/countermark. This drawing paper, which was originally hand made, was specifically developed for the French painter, Jean-Auguste-Dominique Ingres (1780-1867). It usually has a 'Not' or 'Rough' surface and the resulting 'tooth' has an excellent surface for soft media such as pastel, charcoal and conté (Turner, p.119, 1998). Fibre analysis, using phloroglucinol and Herzberg stained samples examined by polarising light microscopy (PLM), confirmed that the paper was of a high alpha cellulose content, largely consisting of cotton, with a small chemical pulp component. Having established that the paper was of a good quality, the extent of the degradation became even more puzzling.

### Pigments

The results of analysis of pigments by PLM, Raman and SEM/EDX provided in

the following sections are based on a report by David Wise from the University of Canberra.

Representative pigment samples and cross-sections were taken from degraded and non-degraded areas of the image and support to attempt to identify similarities and differences between the two. Sampling was concentrated on the white and yellow areas as these seemed to be the colours which displayed the most variable degradation patterns.

PLM AND RAMAN

Analysis using PLM, confirmed using Raman, indicated a fairly limited palette. Yellow pigmented areas were comprised of mixtures of chrome yellow (primarily lead chromate, but possibly strontium chromate), yellow ochre (hydrated iron oxide) and burnt earths, such as burnt sienna (iron oxide). The brightest yellow highlights were almost pure chrome yellow while the earths were used to give warmth and depth in shadow areas. Greens were found to be a combination of these chrome yellow and ochres with Prussian blue (ferric ferro-cyanide). The blacks were achieved using a combination of very fine carbon black and charcoal. In the flesh areas there was the additional use of a red pigment to give a purer tone. Unusually for the period, this was found to be red lead with small amounts of vermilion. Red lead is often found as an additive to the more expensive vermilion. As would be expected with a pastel medium all of the pigments were heavily adulterated with calcium carbonate. This was identified by PLM as both a natural chalk containing many coccoliths and calcite evidenced by numerous twinned particles. Calcium carbonate was also present in most of the Raman spectra. Smaller amounts of barium sulphate, as the natural mineral barytes, were present in some of the samples examined and it was especially visible in the cross-sections with the inclusion of some massive almost right-angled flakes.

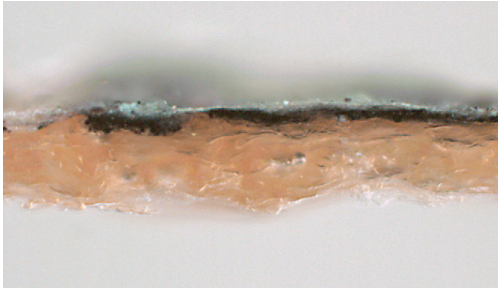
Table 1: Results of Pigment Analysis

| Colour Sample | Site where sample was taken | Results gained using PLM & Raman |
|---|---|---|
| Yellow pigmented areas | Collar of vest | Mixtures with chrome yellow (lead chromate) |
| Yellow Ochre | Hat and collar of vest | Hydrated iron oxide |
| Burnt earth | Hat | Iron oxides, including burnt sienna |
| Bright yellow highlights | Collar of vest | Pure chrome yellow |
| Greens | Associated with black outlines on shirt collar and sleeves | Combination of all of the above pigments with Prussian blue |
| Black | Outline of the arms | Fine carbon black and charcoal |
| Pink area | Collar of vest | Red lead and vermilion |
| Areas of obvious retouching | Adjacent to face | Viridian |

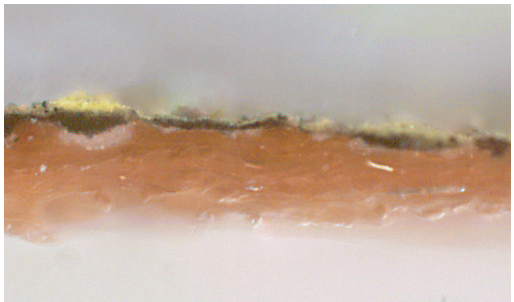
** All samples contained calcium carbonate (natural chalk and calcite).*
** Small amounts of barium sulphate were found as natural mineral barytes in some samples.*

It was suspected from the PLM analysis that some of the samples from the particularly degraded areas contained zinc white, visible as very fine warm-white particles in plane polarised light and very low birefringent particles in crossed polars. This could not be confirmed by Raman due to substantial fluorescence and interference, probably from the binding medium, masking any characteristic, though typically very weak, zinc oxide peaks. In the cross-sections from the damaged areas it was obvious that a thin, brighter white pigmented layer underlay several of the later yellow, black and brown layers and that this white layer had been laid down onto the paper first before the execution of the present image. Samples from the unaffected areas did not

have this initial white preparatory layer and in fact all white highlights currently visible on the image contain only calcium carbonate.



Cross-section through non degraded area of support (top)



Cross-section of a degraded area of support, showing white preparatory layer in the fibre matrix beneath pigment layer (bottom)

SEM/EDX

Cross-sections containing the initial white layer were coated and analysed by SEM/EDX which indicated that the white layer contained barium, sulphur and zinc. The barytes particles could be easily seen in the backscattered image due to their high molecular weight. Zinc was identified as being present in the paler interstices between the barytes particles. Small amounts of chalk were also found. In a gum medium, barytes and chalk act as pigments due to the closeness of the refractive indices, unlike in oil where they would be transparent and therefore be classed as fillers. The large particle size of the barytes could indicate that the white under-layers were also in pastel form. Zinc white was widely produced at the time and was comparatively inexpensive. Extending the pigment with barytes and chalk would bulk it out and make it even cheaper.

## Considerations Prior To Treatment

The Curatorial department was consulted throughout the pre-treatment and treatment stages. It was important to clearly outline the limitations of any treatment and take a number of factors into consideration. Excessive moisture was not considered an option as it was anticipated that this would cause major disruption to the chalk media in contact with the highly acidic paper support. The staining and discolouration were disfiguring, but the main concern was the degree of embrittlement of the support which required strengthening before display was possible. Lining was considered the most sensible option.

*Treatment Proposal and Pre-Treatment Testing*

The proposal for treatment was to gently humidify the drawing via ultrasonic humidification or Gortex from one side. It was essential to minimise the amount of moisture at every stage of the treatment, for the following reasons:

- To avoid engendering physical and chemical changes in the pastel
- To restrict further catalysation of the zinc white degradation process
- To limit damage in fractured, weak and highly degraded areas

Lining would be carried out using a low pressure lining table. The adjustable pressure would hold the paper support in place during treatment, cause minimal disruption to the pastel media and also provide good airflow to assist with drying the lining and support quickly.

Prior to treating the drawing, newsprint aged in an oven was used to simulate the lining process of a severely degraded support. Medium weight Japanese Kozo paper was selected as a lining paper and prepared separately with a water-based and solvent-based adhesive (starch paste and Klucel G, respectively).[1] The samples of aged newsprint were humidified using the ultrasonic humidifier and the different linings applied.[2] It was evident that freshly applied starch paste lining was much more successful in application and resulting strength.

Once the lining materials and technique were determined, a simple test was undertaken to select the most suitable

method of humidification to avoid damage or change in the pastel media. Four samples of Bodleian rag laid paper were prepared by applying coloured pastel in a linear pattern, similar to that of the Cossington Smith drawing. Three samples were humidified separately and the 'control' was not humidified. The first sample was positioned pastel side up onto Gortex, both of which were placed over damp blotter in a humidifying chamber for 3 hours. The other two samples were relaxed using the ultrasonic humidifier for 15 minutes and 40 minutes directly onto the image surface while enclosed in a humidifying chamber. Gortex humidification was found to be by far the best method with absolutely minimal change to the pastel. The following table outlines the observations of this testing.

| **Pastel sample** | **Appearance of pastel to the** | |
|---|---|---|
| | naked eye | . under x40 magnification |
| Control | Chalky, dusty. | . Powdery, particulate |
| GORTEX Humidification For 3 hours, followed by starch paste and Japanese paper lining. | Chalky, dusty. | Particulate and powdery. Impression of Vilene evident after smoothing while lining |
| SHORT US Humidification For 15 minutes, followed by starch paste and Japanese paper lining. | Waxy appearance, slightly more colour saturation, slightly less chalky and fluffy. | Some colour pastels more compacted & clumped than others. Impression of Vilene evident after smoothing while lining. |
| LONG US For 40 minutes, followed by starch paste and Japanese paper lining. | Waxy, crayon-like appearance More colour saturation, loss of chalky appearance. Application strokes are much less distinct. | Caked, loss of powdery quality. Compacted, particles had sunk down into paper fibres. Colours had bled a little at the edges |

Table 2: Effect of moisture from humidification (ULTRASONIC (US) on the pastel medium
Samples prepared using Faber-Castell Pastels and washed laid Bodleian paper.

## TREATMENT

Flaking media in the areas of retouching were consolidated using a 2% solution of methylcellulose in 50:50 water/ethanol. The non-image areas of the support were lightly cleaned using a soft brush. Local wet cleaning with 50:50 water/ethanol was undertaken, also in non-image areas, on the edges and in the top right quadrant of the support, using the vacuum suction table. Old Japanese paper repairs were removed from the verso of the drawing. It was gently humidified from the verso, using Gortex and wet blotter. After approximately two and a half hours local wetting out was undertaken in the non-image areas using water and a Japanese wetting brush to relax the paper support fully. Once the drawing was evenly humidified, a medium weight Japanese Kozo paper was brushed with starch paste and placed on the low pressure lining table paste side up and allowed to dry out slightly. The drawing was laid down onto the lining paper starting from the top of the image. The lining table facilitated control over the applied pressure, and allowed careful placement and some manipulation of the work. The lined work was partially dried on the table using the air circulation function on low pressure. Once the lined drawing was sufficiently dry, it was gently stretched on a *karibari* board by adhering the edges of the lining with dilute wheat starch paste to the board. Three minor creases in the drawing, resulting from the lining procedure, were reduced by slitting the lining paper and re-stretching the work on the *karibari* board. Lifting areas and loose fragments were positioned and adhered into place with starch paste. Cracks and losses were pulp-filled using toasted cellulose powder and a 2% solution of methyl cellulose. Retouching was carried out using pastel pencils.

## CONCLUSION

Overall, the treatment is considered to have been very successful and the results achieved were anticipated given the fragility of the drawing. Discussion with NGA Curators is on-going with regard to the extent of retouching, particularly in the non-image highly discoloured areas. In designing a suitable treatment strategy, it was vital to recognise that the patterns of deterioration were inherent to the

materials. This has meant limiting aggressive treatments due to the migration of acidity from the paper, potentially disastrous for drawing media based on chalk. It was still necessary to determine a treatment which would strengthen the extremely brittle support without disrupting the pastel media and allow the drawing to be displayed upright. The test procedures in the pre-treatment stage were useful in ensuring that the integrity of the image and the inherent qualities of the pastel were maintained.

The exact reason for the accelerated deterioration of certain parts of the pastel drawing has not been conclusively proven. However zinc oxide has been shown to catalyze the chain scission of cellulose by acting as a radical initiator through the production of hydrogen peroxide in the presence of light. This phenomenon has been recorded in previous conservation literature (Daniels, 1984 and Hey, 1987-88) Other pigments such as those containing copper are known also to cause degradation of organic materials such as paper, but no trace of copper pigments were found in *Portrait of Diddy* (Banik,1982-83 and Daniels, 2002). Zinc oxide pigment was found in areas of high deterioration underlying other layers containing pigments of known stability. It was absent in areas that were not degraded. The 'drawn' patterns of deterioration visible on the back of the support are consistent with the use of a zinc white preparatory layer prior to the execution of the image. Of the other pigments found on the drawing, while some may have stability problems which affect their colouration for example chrome yellow and red lead, none is known to accelerate the deterioration of paper supports.

This project would not have been possible without the close collaboration of the NGA Paper Conservators with Curatorial staff at the NGA and experts at the University of Canberra and the Australian National University. The valuable analytical information that was generously provided contributed greatly to the success of the project. The intimate connection between the artist and sitter has led to creation of a number of special works by Cossington Smith, of which Portrait of Diddy is one.

## FUTURE RESEARCH

The NGA paper conservation team intends to continue investigations into the works of Grace Cossington Smith in preparation for the exhibition in 2005, and into the migration of zinc white and the ramifications for works on paper.

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ENDNOTES

[1] Klucel G (5% w/v in ethanol) was brushed onto the Japanese paper on Mylar. A second coat was applied to half of this sheet. A second sheet of the Japanese paper was brushed with buffered starch paste (Calcium Hydroxide). The sheets were left to dry on the Mylar. The adhesive was activated with water and ethanol respectively when ready to use.

[2] *Re-activated starch paste lining* (Japanese paper) The test piece of brittle newsprint and prepared starch paste lining were relaxed using an ultrasonic humidifier. Thick blotter was placed on a Willards cold lining table. The moistened re-activated starch lining was positioned, adhesive side up on the blotter, then the newsprint was placed down onto the lining paper. The vacuum table was turned on – low pressure to start with and then increased pressure. This was unsuccessful as the bond with the lining was weak due to the thin layer of starch paste on the lining paper.

*Fresh starch paste wet lining*
Fresh paste was brushed onto the Japanese lining paper and the newsprint was positioned. The vacuum table was turned on and the pressure increased from 40% to a maximum of 80%, this was considered essential for drying.

*Re-activated Klucel G lining*
A sample of newsprint was humidified using the ultrasonic humidifier then placed onto the lining paper, half the sheet with one coat of Klucel G and the other half with two coats, onto blotter on the vacuum table and misted with 50:50 water/ethanol. The lined newsprint was partially dried while on the vacuum table. The newsprint did not adhere to the side of the lining with only one coat of Klucel G, while it adhered well to the side with two coats.

The latter two tests were placed on the karibari board to dry and stretch. The starch-pasted lining was the more successful overall. Only the Klucel G lining with two applications of Klucel G was reasonably successful.

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