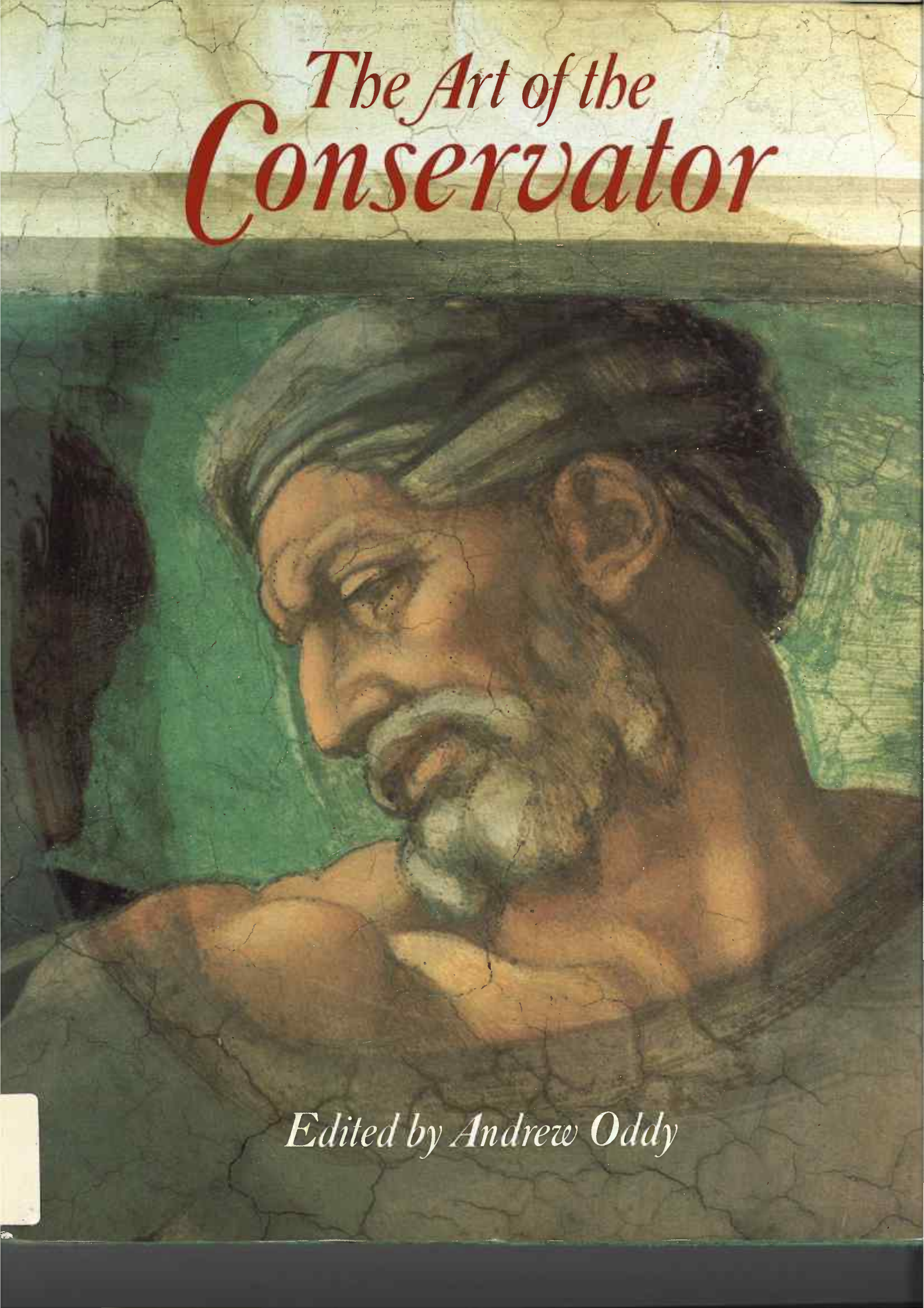
The Art of the Conservator



Edited by Andrew Oddy

2 The Portland Vase

Sandra Smith

The Portland Vase is one of the British Museum's greatest treasures and the finest example of Roman cameo glass in existence. In 1845 it was smashed by a vandal and repaired; it then underwent conservation again in 1948. By 1987, when the Vase formed the centrepiece of an international exhibition of Roman glass entitled *Glass of the Caesars*, the adhesive used in the 1948 repair was showing severe signs of ageing and had turned a dark yellow-brown colour. More alarmingly, when the Vase was tapped it produced not a ringing tone but a dull, lifeless thud. This was a sure indication that some of the pieces of glass were held in place only by the surrounding fragments. The Vase was therefore in a very fragile state and needed immediate attention.

After detailed discussion with the curators responsible for the Vase, it was agreed that immediately after the *Glass of the Caesars* exhibition it should be taken off display for a year. This would allow time for it to be dismantled and reconserved, and would also provide an opportunity for further research to be carried out into how the Vase was originally made. The Museum anticipated world-wide interest in this unique vessel, and a press conference was arranged to inform the public of its imminent reconservation. The resulting press coverage was sensational, with headlines like 'Museum to smash Roman vase'.

The main body of the Portland Vase consists of a deep blue glass which appears almost black in reflected light, but dark blue in transmitted light. The surface decoration is provided by a thin layer of white glass, on top of the blue, which has been carved and engraved with great precision so that a sense of real depth is given to the finished scenes.

Exactly how the Vase was made has been something of a mystery. It was widely assumed that it was made by a technique known as 'casing', meaning that the glassblower formed a 'cup' of white glass and blew the blue glass into it. Having thus 'cased' the blue glass in the white, he would then have given the Vase its correct shape and size by further blowing and marvering (rolling it on a flat slab known as a marver) before finally adding the handles. It was hoped that this theory could be proved or disproved once and for all during the course of the conservation process. What was more certain was that, once cool, the Vase was transferred from the glassblower to a cutter or engraver, probably a gem-cutter, who must have worked the outer layer of white glass with engraving tools and files.

The cutter's skill is apparent in the treatment of the masonry and the figures, though it is possible that the surface was reworked in the seventeenth or eighteenth century. The interpretation of the scenes has been hotly debated for many years. The scenario is evidently one of love and marriage with a mythological theme, in a marine setting which includes a sea-snake. The precise identification of the figures

remains uncertain, though several scholars have suggested that the two sides are to be 'read' as one, with the principal figures being Peleus and Thetis.

Attempts have been made in more recent years to produce a replica of the Vase. However, apart from versions by John Northwood and Joseph Locke, made in the 1870s, few have been successful and most have ended with the vessel breaking under the intense working required.

The Portland Vase as we know it is incomplete, the base of the original vessel, which would possibly have tapered to a point or ended in a base-ring, having been broken and repaired in antiquity. During this ancient repair, the bottom edge of the Vase was trimmed to allow it to stand upright, and a disc of blue and white cameo glass was added as a new base. However, this disc clearly does not belong to the Vase, as it differs in colour, composition and style. It was evidently cut down from a much larger cameo plaque. This is no longer attached to the base, but exhibited separately.

The Vase takes its name from the Portland family, who owned it from soon after its arrival in England in 1810. The Dowager Duchess of Portland bought the Vase for the sum of 1,800 guineas, together with four less important pieces, from Sir William Hamilton (1730–1803), then British Ambassador to the court at Naples. (Sir William is of course better known as the husband of Lady Emma Hamilton, the mistress of Lord Nelson.)

Before the Vase came to England it had already had quite an eventful and well-documented history. It was reported to have been discovered in or shortly before 1582 inside a marble sarcophagus excavated under the Monte del Grano on the southern outskirts of Rome. This was thought to be the burial place of the emperor Alexander Severus, who reigned from AD 222 to 235, and of his mother, Julia Mamaea. However, the Vase would already have been an antique when it was placed in the tomb; it is most likely to have been made around the turn of the first century BC/AD, during the reign of the emperor Augustus (27 BC–AD 14).

After its discovery in the sixteenth century the Vase became the property of Cardinal Francesco Maria del Monte (1549–1627) and was included in a work on Roman cameos by Cassiano dal Pozzo (1578–1657). After del Monte's death the Vase came into the possession of Cardinal Francesco Barberini, who allowed dal Pozzo to draw six sketches of it for his *Museum Chartaceum* ('Paper Museum'). This extensive collection of drawings still exists, divided between the Royal Library at Windsor Castle and the British Museum.

By the mid-eighteenth century the wealth of the Barberini family had declined, principally as a result of compulsive gambling by Donna Cornelia Barberini-Colonna, Princess of Palestrina and the last of her line. The princess was a very passionate but unsuccessful card player, and lost most of the family fortune. The Vase was sold to James Byres, a Scotsman living in Rome, who bought it with a view to reselling it almost immediately. Before doing so, however, he had a mould made and sixty copies cast from it in plaster of Paris by James Tassie, after which the mould was destroyed on Byres' instructions. One of these plaster copies is in the collection of the British Museum.

It was in 1783 that the Vase came into the possession of Sir William Hamilton, an avid collector of antiquities. The Vase was now famous throughout Europe, and

even Queen Charlotte, wife of George III, specially asked to see it. However, the £1,000 that Sir William paid for the Vase crippled him financially, forcing him to sell it to the Dowager Duchess of Portland, who included it in the Portland Museum, a collection of natural and artificial curiosities. On her death in 1785 the museum and its contents were sold at auction, but the Vase was bought back by the 3rd Duke of Portland. In order to secure the Vase for his family, the Duke had to do a deal with Josiah Wedgwood, the famous porcelain manufacturer. Wedgwood agreed not to bid for the Vase on the condition that the Duke would lend it to him for one year so that he could model it for reproduction in his range of Jasperware. In 1810, after 29
a minor breakage had occurred, the 4th Duke of Portland entrusted the Vase to the care of the British Museum.

The next significant moment in the 'life' of the Vase was 3.45 p.m. on 7 February 1845, when a young man who later gave his name as William Lloyd walked into the gallery where the Vase was displayed and, wielding a heavy object, brought it crashing down on to the showcase, smashing both the case and the Vase into hundreds of pieces. The culprit was apprehended, and when questioned at Bow Street police station gave as his excuse that he was suffering from 'a kind of nervous excitement'

29 Jasperware copy of the Portland Vase, made by Josiah Wedgwood *c.*1790. British Museum.

as a result of a week-long drinking session. Why he had chosen to destroy the Portland Vase he was unable to say. Charges were brought against him by the Museum, but because of ambiguities in the wording of the Wilful Damage Act which only covered damage to property up to the sum of £5, Lloyd could be charged with breaking the showcase but not with breaking the Vase itself. He had a choice of a £3 fine or two months' hard labour in a house of correction. Unable to pay the fine, he went to prison, but was released two days later when his fine was paid for him by an unknown benefactor, mysteriously rumoured to be the Duke of Portland himself.

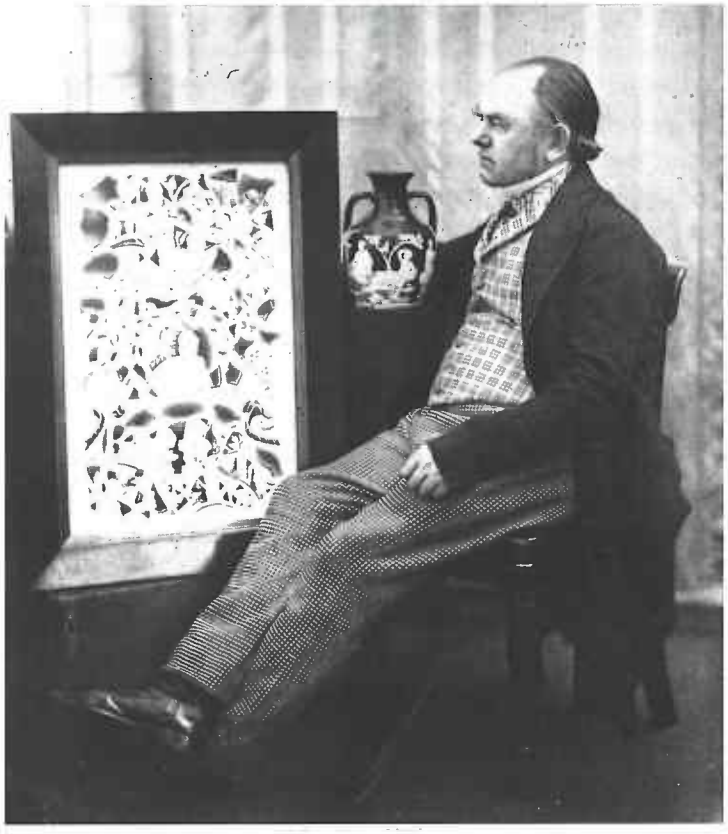
Meanwhile, the British Museum had to try to repair the damage to the Vase. John Doubleday, a museum craftsman, was entrusted with this arduous task, and by September of the same year the Vase was restored and back on display in the galleries. However, Doubleday had been unable to locate the positions of thirty-seven of the smaller fragments of the Vase, and these were given to a certain Mr Gabb, who was commissioned to make a special box to contain them. Unfortunately, Gabb died before he could complete his task, and the fragments were lost to view for the next hundred years.

In 1945 the Vase was purchased by the Museum from the Portland family, and the resultant publicity moved one of Gabb's descendants to return the chips of glass to the Museum. The curators took some convincing before they would believe that they were actually fragments of the Portland Vase. By this time Doubleday's restoration had begun to show signs of ageing and in 1948 it was decided to make a second attempt to restore the Vase in order to replace the now 100-year-old adhesive and, it was hoped, to incorporate some of the returned fragments. This second restoration was carried out by J. H. W. Axtell, a senior conservator in the Department of Greek and Roman Antiquities, who specialised in the conservation of Greek vases. Axtell was able to insert only three of the previously unplaced fragments into the Vase.

The 1988 restoration of the Vase was undertaken by Nigel Williams and Sandra Smith of the Ceramics and Glass Section of the British Museum's Department of Conservation. A great deal of advance preparation was needed to ensure that the most sympathetic methods and materials would be used. Furthermore, arrangements had to be made to accommodate the BBC Archaeology and History film unit, who wanted to record all the processes involved for a programme in the *Chronicle* series.

The involvement of the BBC, as well as the interests of scholars who wished to examine the glass, meant that a strict timetable had to be established for the dismantling. The first task, however, was to find out as much as possible about the previous conservations. The only records of the 1845 conservation were a black and white
30 photograph of John Doubleday with the completed vessel and a line drawing of the fragments, which was discovered in the Museum archives. It was hardly surprising that there were no written records of the materials used in 1845, but something of a shock to find that neither were there any records of the techniques used by Axtell in 1948.

It was therefore necessary to resort to the memories of four longer-serving or retired conservators who had been at the Museum at the time of the 1948 restoration. Each was absolutely certain that he remembered which adhesive had been



30 John Doubleday, the first restorer of the Portland Vase, seated beside the reconstructed Vase and a detailed watercolour made in 1845 to record all the individual fragments before the reconstruction began.

employed: one stated emphatically that it was animal glue, another that it was an early epoxy resin, while a third declared that it was shellac. A fourth suggestion was that the adhesive was a combination of shellac and animal glue! As a result of this confusion, attempts were made to extract samples for analysis from the existing joins. These were unsuccessful, however, as Axtell – quite properly – had carefully cleaned all the excess glue off the surface.

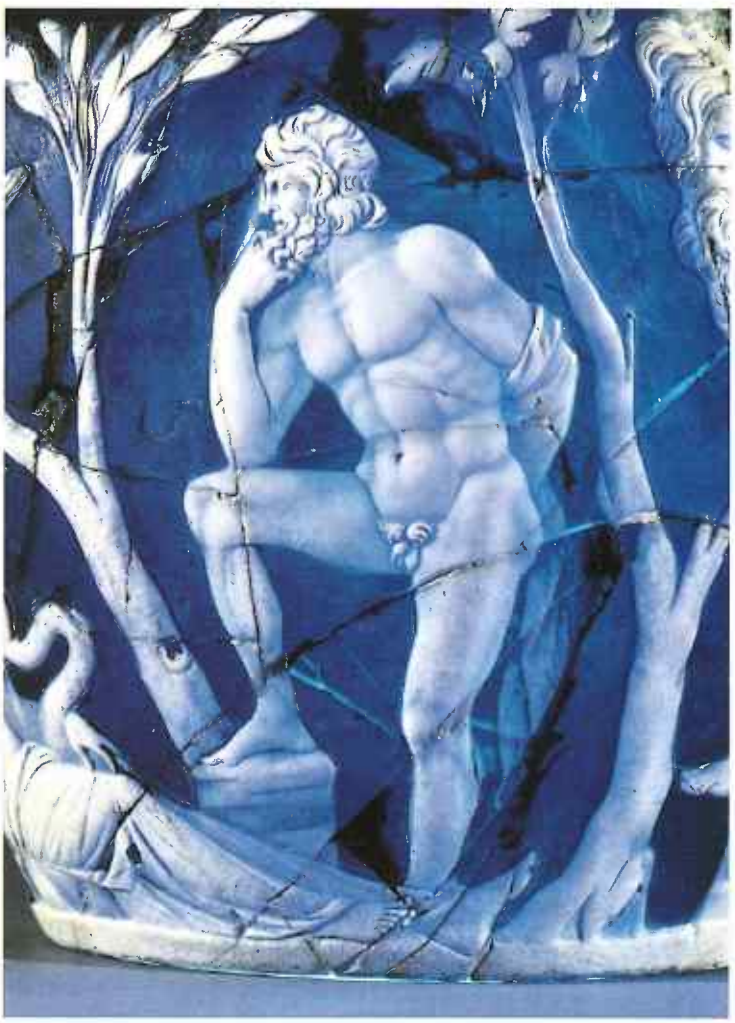
Meanwhile, the Vase was extensively photographed to show its condition before reconservation. Special techniques were used to reveal all the break lines and filled areas in both the blue and the white glass. The inside of the vessel was 'bathed' with an intense ultraviolet light, so that the filled areas appeared dark and the break lines showed up clearly. A plan of the position of each fragment of glass was made on a scale drawing of the Vase. This would be useful when the glass was dismantled. 31

The first restoration had lasted for 100 years; the second only 40 years. The aim was now to find an adhesive which would make the present restoration last as long, if not longer, than the first. The requirements were that it should remain clear for a long time and should not lose adhesion, while remaining easy to remove. It was also important that it should be easy to apply. A number of possible adhesives were selected by the conservators and sent to the British Museum's conservation scientists for testing.

The conservators also had to find the safest possible way of dismantling the Vase so that all the 200 or so fragments could be removed without damage. As the adhesive used in the previous restoration had not been identified, any one or more

of at least four different solvents might be needed to dissolve it. It was therefore decided to use a combination of solvents.

Before the glue could be softened, precautions had to be taken to prevent the uncontrolled collapse of the glass sherds and smaller slivers. A scheme was thus devised which involved making inner and outer support moulds to hold the fragments in place once the adhesive was dissolved. Thin strips of blotting paper moistened with water were overlapped on the inside of the Vase until the whole of the inner surface was completely covered. Two more layers were then applied over the first, each with the paper strips running at a different angle. The Vase was then left overnight, but in the morning it was found that the old adhesive had already begun to soften in some areas, as a result of the penetration of the moisture into the glue. The whole Vase could have collapsed at any moment, so quick thinking and even quicker action was needed to stabilise it. Very carefully and very gently, a thin layer of plaster of Paris was painted on to the blotting paper, and as this dried out a rigid inner support mould was formed. The drying process was a nerve-racking time: there was a chance that the water used to mix the plaster would cause the old adhesive to break down even further. A close watch was therefore kept on the Vase,



31 The break lines and filled areas were emphasised by flooding the inside of the Vase with an intense ultraviolet light. The individual sherds of glass could then be identified.

but the inner support hardened successfully. An outer support mould was then made using three layers of blotting paper. While the outer mould was still damp, plastic bindings, elastic bands and cotton tape were carefully applied around the Vase, like small tourniquets, to give additional support. Each binding had to be tightened gently; too much pressure might cause the fragile sherds to crack or shatter. 32

One of the solvents that was to be used has been known to react with glue and turn pink: if this were to happen on the Portland Vase the resulting stain would be very difficult to remove, particularly from the white glass. Holes were therefore cut in the blotting paper so that the process could be monitored and the treatment stopped if any adverse effects began to appear. The Vase, completely shrouded in blotting paper, was then put into a glass desiccator (a large airtight vessel) and transferred to a fume cupboard. The solvents (acetone and methylene chloride) were mixed together with water and slowly introduced into the top of the container with a hypodermic syringe. The blotting paper absorbed some of the solvent, while the rest evaporated to form a dense vapour around the Vase.

There was now no turning back. After forty-eight hours the adhesive had broken down, the handles were moving, and only the blotting paper and plaster supports were holding the glass fragments in place. The television crew immediately made their way across London to the Museum. Museum photographers were also called to record the dismantling in both colour and black and white. The room was full of people, all with their own jobs to do, and the conservators – already tense at the thought of taking apart almost 200 sherds of glass – had to contend with the added pressure of the film crew and the photographers needing access to a view of the proceedings as well as the thought that they would be recording their every move. A third colleague, Denise Ling, was brought in as an extra pair of hands to steady the Vase should events happen more quickly than expected.

32 (*Above, left*) Strips of blotting paper dampened with distilled water were applied to the outside of the Vase to form an outer support while the old adhesive was softened prior to dismantling.

33 (*Above, right*) Nigel Williams removes the first rim sherds from the Vase.

Before dismantling could begin, the Vase had to be removed from the desiccator. It was lifted as slowly and smoothly as possible, as sudden jolts might have dislodged the sherds. The room was silent, apart from the whirr of the cameras, and as the Vase was placed gently and safely on to the work bench a sigh of relief went round.

33 The first piece of the Vase to be removed was one of the handles, followed by fragments of the rim. Once dismantling had begun, speed was of the essence: as each sherd was removed, the surrounding pieces began to give way; but at the same time the solvents were evaporating, perhaps allowing the adhesive to reharden. There was therefore no stopping for any reason until the Vase was completely dismantled. Nor was there any possibility of the film crew doing retakes of the

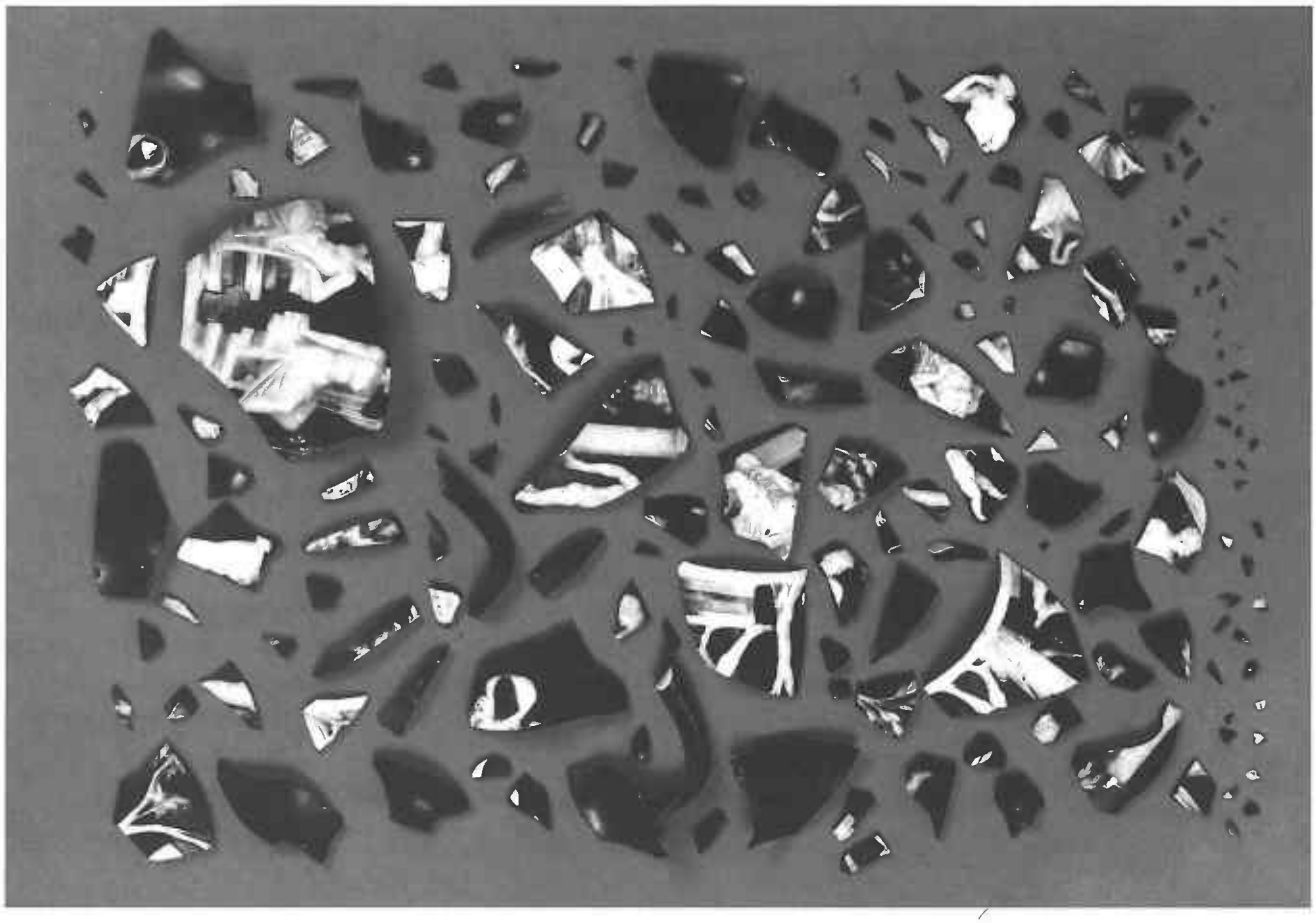
34 process, and filming continued at times literally over the shoulders of the conservators.

The outer support mould was slowly peeled away, and as the sherds were revealed they were removed, numbered and placed in the appropriate position on the plan. Work continued at a steady rate, and samples of the adhesive were taken from the edges of the sherds for chemical analysis. The results showed that the glue was a very early epoxy resin. This was quite a surprise, particularly as some of the epoxy – which is not supposed to be water-soluble – had softened in water. However, this did confirm the original view that the adhesive was unstable and that the decision to reconserve the Vase had been the right one. When the dismantling was complete,

35 there were 189 sherds spread out on the bench.

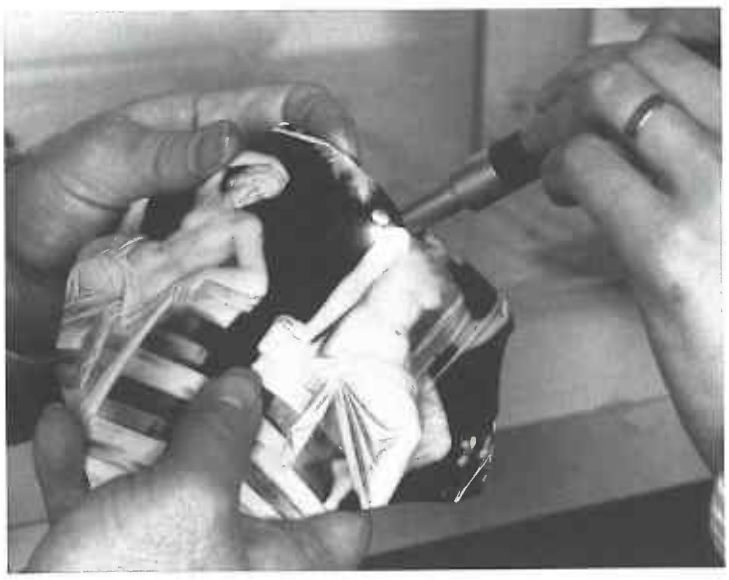
The edges of the sherds were still covered with the remains of the old adhesive and a wax filler. These were removed mechanically, using a scalpel blade and paper

34 The BBC *Chronicle* team filmed the whole dismantling process, at times literally over the shoulders of the conservators.



35 (*Above*) The cleaned sherds laid out ready for reconstruction.

36 Each fragment was cleaned by brushing in a solution of soap and water, to remove the surface dirt and grime built up over nearly forty years of continuous display.



37 The sherds were tacked into position using an acrylic resin cured by an intense ultraviolet light source. A slow-drying epoxy resin was used as the main adhesive. Self-adhesive spots indicated the position of the tacking adhesive.

tissue dampened with solvents. Amid the sticky, soft glue, tiny chips of glass remained in place; these had to be separated, cleaned and put in small glass sample tubes to keep them safe. Every last remnant of glue had to be removed, otherwise the sherds would not fit together properly when the time came to reassemble them. The surface of the glass was covered with a thin layer of dirt, the result of years of continuous display. This was dulling the brilliance of the contrast between the blue and the white glass. Each sherd was cleaned by brushing in water and a mild
36 detergent and then patted dry with paper tissue. The beauty of the figures began to glow once more against the dark background.

This was the first time in over forty years that the opportunity had arisen for experts from the various fields of glass technology to examine the sherds of the Portland Vase, and national and international specialists came to the Museum hoping to solve the mystery of how the Vase was made. The sherds were examined for unevenness of colour and changes in thickness; they were examined by eye and under the microscope, but still the experts differed in their opinions. However, according to William Gudenrath of the New York Experimental Glass Workshop, the Vase was almost certainly made by a technique best described as 'flashing', whereby the cobalt-blue body was blown and marvered (manipulated) into a preliminary shape and then dipped into molten white glass, which formed a surface skin. The vessel was then blown to its full size, and the shoulders and neck shaped before adding the two handles. The Vase was then transferred to the engraver.

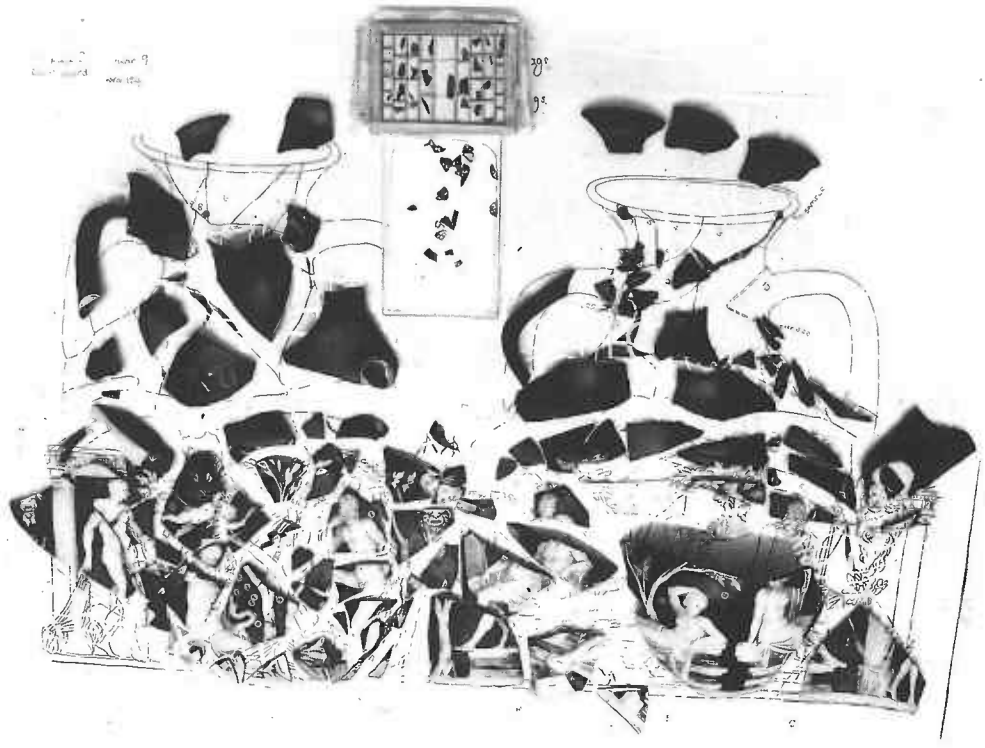
One interesting suggestion is that the glassblower who made the Portland Vase may have been left-handed. The air bubbles within the glass are elongated towards the right, indicating that the glass was swung in that direction during the blowing process. The Museum also took the opportunity to produce a new profile drawing of the Vase, a painstaking process involving the precise measurement of the thickness of the vessel at numerous points across the surface of the glass.

Meanwhile, scientific testing continued on the adhesives proposed for the reassembly. These were an acrylic, which cured under intense ultraviolet light in

a matter of seconds, and an epoxy resin, which cured over five days at room temperature. Each adhesive was tested and retested to make sure that it would cause no damage to the glass and that it would function efficiently as an adhesive for many years. Doubts had been voiced about the reversibility of the acrylic adhesive, and the scientists therefore had to find a solvent which would dissolve it even after a long time. There was also a suspicion that the ultraviolet light would be absorbed by the coloured glass and that this would prevent the acrylic adhesive from curing. This supposition was found to be false when an intense ultraviolet light source was used.

The second adhesive, a very clear epoxy resin, had been tested by the manufacturer under the extreme conditions of the Arizona desert over a number of years and found to retain all its clarity and adhesion. As the British Museum would never have a climate as severe, the conservators felt very confident about this adhesive and an extra pure batch was produced by the manufacturers specifically for use on the Portland Vase. Its only drawback was its long curing time – five days – during which a join could easily move out of alignment. For this reason it was felt necessary to combine it with a fast-drying 'tacking' adhesive, such as the acrylic, which would hold the sherds in place while the epoxy cured. However, each adhesive had been tested only on its own; if they were used together, would one react against the other, stopping it curing or turning it yellow? The adhesives were returned to the scientists for further testing and were again found to give good results.

Once all the visitors had gone, the task of reconstructing the vessel could begin. Normally reconstruction begins either at the rim or at the base of a vessel, whichever is most complete, and the vessel is built up from that point. The Portland Vase was severely shattered on one side (probably the point of impact when it was broken),



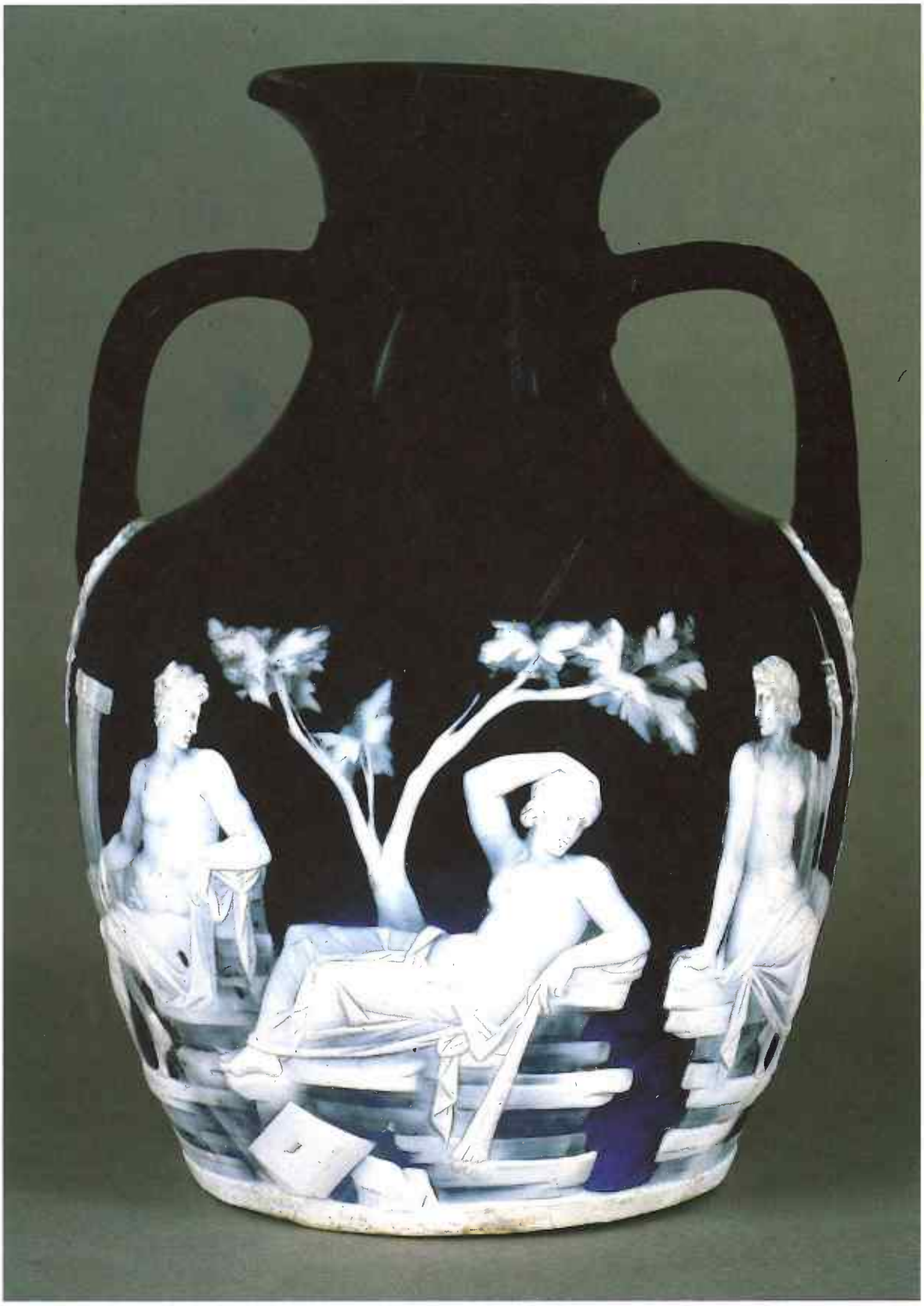
38 The sherds laid out on a plan of the Vase during the process of building the smaller sherds up into larger, more manageable panels.

39 The reconstruction of the shoulder area revealed file marks, where the glass had been abraded during a previous restoration.

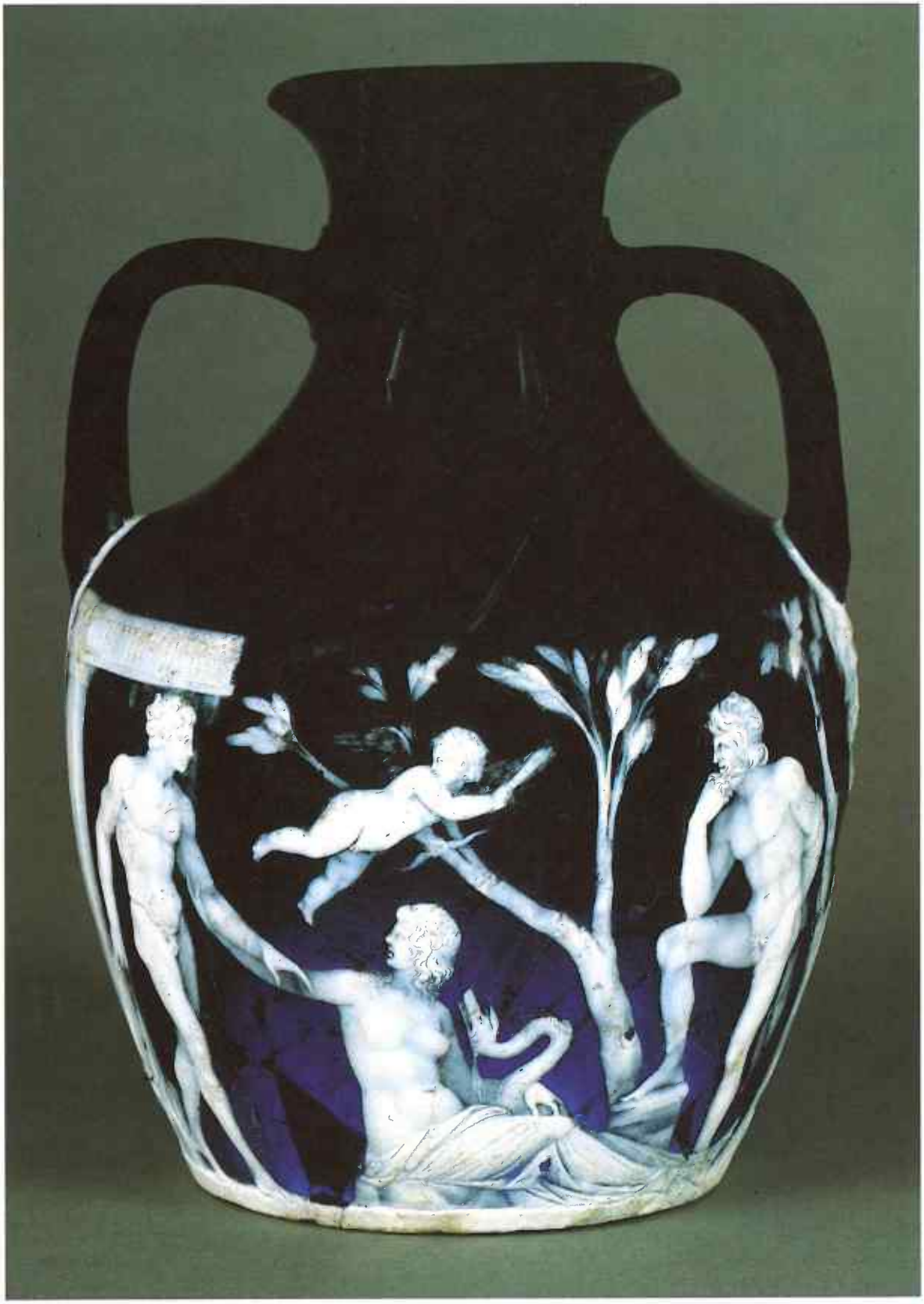
making the normal procedure very difficult. The small fragments were therefore
38 built up into larger panels which were easier to handle and which could then be fitted together in the usual way, as if they were single sherds. This was a process fraught with difficulty, as building up separate panels increased the risk of misalignment when these panels were eventually stuck together.

To retain the clarity of both adhesives and to enable them to achieve their maximum strength, the edges of the sherds had to be cleaned with almost clinical thoroughness, using cotton wool swabs dipped in a mixture of 15% ethanol and 85% acetone. The epoxy, which had to be mixed with great care, was painted on to one of the sherd edges, leaving a small space into which a drop of the acrylic adhesive was introduced to act as a tacking agent. The two sherds were then pressed together and any excess adhesive wiped from the surface of the glass with swabs. Each join had to be checked and double-checked by hand and under a microscope to make sure the sherds were exactly aligned before the adhesive was allowed to cure. A sticky label on each join indicated the position of the acrylic adhesive, so
37 that the ultraviolet light source which would cure it could be accurately directed.

To a conservator the senses of sight and touch are essential, and the goggles and gloves worn to protect the eyes and hands from the intense ultraviolet rays seriously impaired both. Slight misalignments of the sherds could only be detected once the protective clothing was removed, that is, after the tacking adhesive had cured. If this occurred, the adhesive had to be dissolved, and the sherd edges recleaned before another attempt could be made to stick them together correctly.



40, 41 Two views of the Portland Vase after restoration. H. 24 cm. British Museum.



Gradually the fragments of the Vase were reformed into panels which were then treated like large sherds and reconstructed in the more conventional way, beginning at the base. The curve of the vessel was recreated, and the last fragment completing the circle of the body – always the most difficult to align – slotted in perfectly. This had all been achieved within a few days, and by a week before Christmas 1990 the Vase was complete from the base up to the shoulder. The BBC crew wanted the whole reconstruction 'in the bag' that week, but suddenly things began to go wrong. The next sherds were tacked into place, carefully aligned with the fragments beneath, only to find that they did not fit together correctly.

The sherds were dismantled and reassembled, but still the problem remained. Assembling the Vase right up to the rim showed how serious the misalignment was, and yet it seemed impossible that it should be so. If a mistake had been made in the reconstruction lower down the Vase, this would have been clearly visible in the engraved scenes. The film crew stood by as the Vase was dismantled and reconstructed time after time. It was then noticed that the edges of a number of the 39
shoulder and neck sherds were heavily scored with lines made by a file. Abrading the edges of sherds in this way, rather than dismantling and re-reconstructing an object, was formerly a common procedure when pieces were misaligned and did not fit exactly into place. This misalignment becomes more acute towards the end of a restoration, so it is not surprising that the offending sherds were only discovered when the new restoration of the Vase was nearing completion.

Amid their shock and disbelief that such a thing could have been done to the Portland Vase, the conservators had to find a way of restoring the damaged area to its original dimensions. The edges of some sherds had been so heavily worked that the pieces did not join together at all. By the end of that week a perfect reconstruction

42 The smaller chips of glass were lifted and positioned using vacuum tweezers.

43 (*Left*) Missing areas of blue glass were filled using precoloured epoxy resin, which was slowly built up layer by layer to the same height as the original surface.

44 (*Right*) A detail before restoration showing losses in the white glass. The nose of the seated figure was remodelled using a plaster cast of the Vase made by James Tassie in the eighteenth century as a reference.

was no closer than it had been at the beginning, and the conservators left the Museum for a sleepless Christmas holiday. The New Year brought an acceptable compromise in the form of a decision to leave gaps between some of the sherds, allowing the original shape of the vessel to be restored. The gaps would later be filled with resin.

Attention now turned to the tiny chips which had remained unplaced in the previous restorations. Vacuum tweezers were used to handle the slivers of glass and 42
to position them. After a number of weeks, all but eleven of the fragments had been fitted into the Vase. It was known that all those that remained came from the inside of the vessel and it was therefore difficult to justify spending any further time on trying to find places for them.

When the Vase was shattered in 1845 some areas were damaged beyond repair because the glass was reduced to dust and tiny slivers. These areas of loss, as well as the gaps between the abraded neck sherds, had to be filled with a modern resin to make sure the Vase was sufficiently stable and strong to withstand handling, and also to give continuity to the scenes carved in the white glass. The same epoxy resin used as an adhesive in the reconstruction of the vessel was used as a filler, but now it was precoloured to match the surrounding glass; other inert fillers were also added to give the resin a similar texture to that of the glass.

The blue colour of the resin was made up of three different pigments, a deep

blue, a turquoise blue and a violet. Violet is a notoriously difficult pigment to deal with, as it is unstable and often fades with age. The adhesives had been chosen for their long-lasting qualities, and it was necessary to ensure that a change in the colour of the resin filler would not be the cause of a further reconservation. After much testing and retesting, a violet colour (used by a leading American car manufacturer) was found which had good permanence.

In order to apply the resin to the gaps, a support was made on the inside of the Vase by taping sheet dental wax over each gap and letting it cool. The resin was then poured into the gap from outside. In some areas several applications of resin were needed before the contour of the vessel could be built up. The gaps were deliberately overfilled so that the hardened resin could be worked back flush with the surface of the surrounding glass and then polished to give a sympathetic finish. 43

Once the areas of blue glass had been filled, the white areas could be built up on top. In some cases this was a very simple procedure, but in other places parts of the figures were missing and remodelling was necessary. The ethical question now arose: was it right to restore these missing areas? If the Vase remained as it was, the continuity of the scenes and their beauty would be impaired by the areas of loss; but if these areas were filled, the conservators had to be very careful to retain the original style. Fortunately, they could refer to the Tassie plaster copy, made before any major breakage occurred, and this was eventually used as a template for the accurate remodelling of the damaged areas. Once all the filling had been completed, the whole vessel was given a thin coating of a microcrystalline wax to restore the sheen to the glass surface. 44

This completed the third conservation of the Portland Vase. The BBC crew returned to the Television Centre to edit well over 1,000 hours of film footage into a fifty-minute programme, while the conservators went back to more routine tasks and the Vase was put back on display in the Museum galleries, where it continues to excite the admiration and curiosity of scholars and public alike. 40, 41

Acknowledgements

The author would like to thank everyone involved in the third conservation of the Portland Vase, but in particular Nigel Williams, Chief Conservation Officer and leader of the project, Denise Ling, Conservation Officer, and all other members of the Ceramics and Glass Section of the Department of Conservation at the British Museum. Trevor Springett made the invaluable photographic record of the whole process, and Sue Bradley and the British Museum Conservation Scientists carried out the essential analysis on the adhesives and pigments used. Finally, thanks are due to Kenneth Painter, then Deputy Keeper, and members of the Department of Greek and Roman Antiquities for their assistance in this project; also to Veronica Tatton-Brown for her advice on this chapter. All photographs are © The Trustees of the British Museum.

Further Reading

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