The Last Judgment: Notes on Its Conservation History, Technique, and Restoration

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The Sistine Chapel: A Glorious Restoration

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Historical Notes

The documentation concerning the conservation history of the Last Judgment was and remains scarce despite the research undertaken over the last few years. Documented interventions after the sixteenth century are very few, and the restorations carried out in the Sistine Chapel under Popes Urban VIII (1623–43) and Clement XI (1700–21) seem not to have included the Last Judgment. This can perhaps be explained by the fact that the fresco, because of its particular nature—its location on the altar wall and because it was within easy reach—must surely have been carefully and constantly maintained. Certainly this was true under Paul III, who by motu proprio in 1543 created the office of mundator, or cleaner, charged with the responsibility of “cleaning away the dust and other kinds of dirt, as previously mentioned, from the paintings in the said chapel of Sixtus, both those on the ceiling of events fulfilled and those on the wall of events prophesied, and to make all efforts to keep them free from dirt.” The mundatores are documented as active through the pontificate of Gregory XIII (1572–85). Thereafter the documents refer to a custos, who most likely had an assistant, although we cannot be certain when precisely this office was established.

Aside from this ordinary maintenance, the sixteenth-century interventions on the Last Judgment were not restorations so much as tamperings with the fresco. These censorious interventions were undertaken under Pius IV and perhaps also under Pius V, following the decree of the Council of Trent laid down on 21 January 1564. Michelangelo, who died on 18 February 1564, less than a month after the Council’s decision, never saw the consequences of its order.

The payment made to Daniele da Volterra’s heirs in 1567 for the work he did on the Last Judgment—Daniele had died the year before, strangely, like Michelangelo, on 18 February—seems to indicate that his intervention took place in 1565, since this is the date indicated in the document. This intervention was planned during the preceding months; the first payment for the scaffolding was made on 23 August 1564 to the Florentine carpenter Master Zanobio di Mariotto. We know that this payment was for the Last Judgment because the next payment, on 7 September—this time for the necessary wood—records explicitly “17 scudi and 60 baiocchi paid for other wood taken away to make the scaffolding on the Last Judgment wall in
the architrave is Clement XI's, but it is not original to the door frame and was added to it after the preexisting arms were removed.

The creation of this door, whenever it occurred, prompted the destruction, or at least the repainting, of the base, which according to the documents Perin del Vaga had painted under Michelangelo's fresco at the end of 1542. A payment dated 15 November of that year tells us that a certain Giovanni Battista Olgiatto was paid "for the cloth he provided for the cartoon made by Master Pierino, painter, for the base running underneath the painting by Messer Michelangelo in Sixtus's chapel." The present base, usually dated to the eighteenth century although in reality it is difficult to say and it seems older, offers no significant clues except that it reaches the level of the architrave of the original door, which itself seems not to have been raised. Thus it seems unlikely that Michelangelo's fresco was mutilated in the way that past comparisons with Venusti's copy of the Last Judgment have suggested. The present state of the fresco seems to vary little, moreover, from the situation recorded by certain engraved copies, such as those by Bonasone and Ghisi, both executed after 1545.

As far as the period after the sixteenth century is concerned, we know that between November 1662 and February 1663 restructuring work was undertaken in the area around the altar, specifically "on the marble stairs of the throne and the altar of the chapel," although it seems that the preexisting situation was not modified. The documents are so far silent on any restorations of the Last Judgment in the seventeenth century. Those which concern Lugi's interventions in the Chapel between 1625 and 1628 deal exclusively with the fourteen scenes from the lives of Moses and Christ on the lateral walls, the figures of the Popes above, and the backs and the chiaroscuro bases of the seats below.

Mazzuoli's intervention, undertaken from 1710 to 1712, like Lugi's and the others under Clement XI, apparently did not include the altar wall. Mazzuoli restored the biblical stories, the Popes, and the Ceiling, while Germisoni and Pietro Paolo Cristofani repainted the fictive tapestries on the lower register of the walls.

According to eighteenth-century sources, however, a restoration of the Last Judgment was planned. Taia furnishes a series of extremely important clues about the fresco's state of conservation. He wrote, "Certainly the saltpeter, the dust and humidity (if corrective measures are not immediately undertaken) could in a few years reduce these excellent paintings to an irreparable state, as has evidently happened from year to year, especially in the Last Judgment, which is cracking and producing at various places ugly stains of white niter, calcinating the color itself." It is unclear what Taia was referring to when he spoke of white nitrate stains and calcinated colors, or what he meant when he said that the phenomenon occurred "from year to year." Nonetheless, since it is impossible that seeping rainwater was the cause, one might assume that he was talking of the same damage identified by Vincenzo Camuccini in 1825. The latter noted in particular the damage to the sky (the "horizon") above the group of souls rising from the dead and Charon's barge. He reported this to the Academy of St. Luke, saying specifically that "there was once a time when unintentionally they tried to destroy this masterpiece by applying a strong corrosive agent across the entire painting." That this corrosive agent was indeed applied, provoking the damage now visible, was confirmed, as we will see below, during the present restoration. When this happened is less clear. If the whitening is the same as that reported by Taia, then it is likely that this destructive intervention dates back to an undocumented restoration of the seventeenth or the very early eighteenth century. If, on the other hand, it is something else, then its source might be found in the 1762 intervention noted by Richard in his Description historique et critique de l'Italie and which might be linked with Stefano Pozzi.

Camuccini's observations were made after a test cleaning undertaken on Overleaf: View of the Last Judgment before the cleaning and a diagram of the patches on it, which were executed in both true fresco and secco.
Sixtus's Chapel. After the advance he was given in August, Zanobio was paid on 12 November and again on 20 January, 7 April (when a second purchase of wood was also made), and 23 June 1565. He received the balance, including payment for dismantling the scaffolding, on 8 December 1565.

The final payment includes a clear description of what sort of scaffolding was used. The document says, in fact, that it was 42 palmi (30 ft. 11 1/2 in. [9.42 m]) high, essentially covering half the Last Judgment, built in three stages one above the other, the first entirely covered with planks, with a door to climb through, this scaffold being 12 palmi (8 ft. 9 1/2 in. [2.68 m]) deep and 60 palmi (43 ft. 11 1/2 in. [13.4 m]) wide, essentially the width of the wall, with a parapet in front and curtains pulled in front of that, and four marble stairs. This document also specifies that the scaffolding was dismantled afterward, evidently before 8 December.

It is unclear how many figures Daniele da Volterra worked on. Bottari, in his commentary on Vasari's Life of Michelangelo, maintained that Daniele did not finish the task assigned to him and that after his death, "St. Pius V gave the job, at Cardinal Rusticucci's request, to Girolamo da Fano." So far no documentary evidence has been discovered which confirms this. It is a fact, however, that while the repainting of St. Blaise and the partial reworking of St. Catherine were executed in fresco after Michelangelo's original plaster was removed, the other interventions were all painted with tempera. This as well as evident qualitative differences and different ultraviolet fluorescences suggests that different artists worked at different times to cover the nude figures of the Last Judgment.

The many sixteenth-century drawings and engravings, apparently derived from the original fresco and not from copies, that reproduce several figures without their loincloths long after Daniele's death make it quite clear that censorious interventions were undertaken on the Last Judgment at various points in time. Examples include Ambrogio Figino's drawing of Minos, dated circa 1586, Federico Zuccari's drawing of his brother Taddeo copying the Last Judgment, probably executed after 1590, as well as some of Cherubino Ruberti's engravings, particularly his 1591 series. Furthermore, the loincloth covering St. Peter's nudity is a repainting of an earlier drapery that is still discernible underneath. This confirms that there were several interventions and that they were undertaken at different times. They continued at least into the eighteenth century, when J. Richard noted in his Description historique et critique de l'Italie that he had seen in 1762 "some very mediocre artists working to cover with draperies the most beautiful nude figures on the wall and on the ceiling."

There is no documentary evidence for the work some say was undertaken under Gregory XIII to raise the level of the floor around the altar, with the consequent loss of a strip of fresco at the bottom of the Last Judgment. In Ambrogio Brambilla's 1582 engraving depicting the Sistine Chapel during a papal mass, however, as well as in the first state of Vaccari's 1578 print, there are four steps leading up to the altar, as there are now, while according to Paris De Grassi there were originally three. Nonetheless, as John Shearman has noted, the addition of a step, which certainly happened, does not necessarily imply that the level of the floor pavement changed. We find confirmation of Shearman's interpretation, at least for the period after the painting of the Last Judgment, in the fact that the plaster of Michelangelo's fresco overlaps the marble door frame to the right of the altar, which now connects the Chapel with the stairs going down to St. Peter's and which in the fifteenth century—the door frame bears the coat of arms of Alexander VI (1492–1503)—led into the sacristy. The door to the left of the altar, which today opens into the sacristy, offers further evidence. It was broken through either during or after the pontificate of Julius III (1550–55), since it was under this pope that the floor of the sacristy vestibule was raised to the level of the altar, thus creating in the space below a well for the stair leading to St. Peter's. The coat of arms we see on
the group of angels carrying the Column of the Passion in the right lunette with a possible restoration of the entire fresco in mind. Called on to evaluate the artist’s work, the Academy of St. Luke rejected this possibility, not so much because it criticized the results of the trial cleaning, which it judged positively, but because it feared that the undertaking might make more evident the damage provoked by earlier restoration and noted by Camuccini himself. After this attempt to clean the *Last Judgment*, the only one actually documented, the subject of further restoration was not raised again until the present day. Seitz’s intervention in 1903 and Biagetti’s in 1935–36 were undertaken only to consolidate the plaster. The accusations that Biagetti had emphasized the white “scorch marks” by too forceful a cleaning are totally unfounded since no cleaning was undertaken.

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**The State of Conservation**

The surface area of the *Last Judgment* measures 591 square feet, or 180.21 square meters (this figure was calculated by a computer based on photogrammetrical reliefs). Its state of conservation is extremely varied due to the number of successive interventions over the centuries. This lack of a homogeneous surface is made especially clear by the tonal discontinuity across the painting. The lowest level, with the Resurrected Souls and the Damned descending from Charon’s barge, has darkened considerably, and even more so in comparison with the sky above, which was greatly lightened in the past due to the corrosive agents referred to by Camuccini. The central part of the composition is also extremely dark, particularly in the peripheral band of figures, including the group of saints and the Elect surrounding Christ and the Virgin. The two lunettes above are markedly lighter and more legible. The reason the lunette with the column is easier to read is certainly due to the cleaning Camuccini undertook in this area in 1825. Similar circumstances might explain the state of conservation of the left lunette. The same is true of the much-retouched group of the Elect behind St. Peter, even though the artist stated that he had worked only on the group of angels in the right lunette.

Besides being extremely dark, the painted surface has been stained and made opaque by foreign substances, predominantly animal glues, which provide the ideal conditions for the development of microorganisms. Colonies of fungus are especially prevalent on the upper part of the wall, and their removal leaves small, round stains that are lighter in color than the surrounding area because the fungi have reached even the patina closest to the pigment.

Past restorers added small amounts of vegetable oil to the glue—or more correctly the glue water (“acqua di colla”)—that was used to brighten the darkened colors. The oil served both to make the glue easier to work and to reinforce the glue’s capacity to revivify the fresco’s colors. In some cases it seems that oil alone was applied, again with the intention of intensifying the tones. Where the plaster was more porous the oil was absorbed, but in many instances it remained on the surface, creating irregularly shaped stains and channels along the craquelure of the plaster.

The film of foreign matter across the *Last Judgment* is very uneven. Where it is thicker, the surface appears dark and vitreous, and where it is thinner, the painting is brighter and dry. The fresco did not suffer from seeping rainwater because the wall was protected by the Sacristy rooms immediately behind it. This is most likely the reason less glue was applied to this fresco in past restorations than to the Ceiling. The consistency of the layers is therefore noticeably thinner, especially in comparison to the stratum of glue on the lunettes.
Numerous areas of retouching are evident across the fresco, all of them of low quality at best. There are also many patches of test cleanings or traces of attempts to clean the painting, all, with the exception of Camuccini’s, undocumented. It is impossible, therefore, to date them, although they are presumably relatively recent. The retouchings can be divided into two general categories: those executed with full-bodied color and often covering Michelangelo’s *pentimenti*, or corrections, which have created chalky, dull masses of dark brown color; and those executed with small, dark, monochromatic, semitransparent and usually cross-hatched brushstrokes that were intended to reinforce shadings and to recover the modeling of figures flattened by the veil of altered foreign matter.

The plaster itself is in very good condition. The only area where it was seriously detached from the wall was under the marble bracket. The absence of the bronze or brass clamps that were so numerous on the Ceiling confirms that there were no static difficulties in the past, with the exception of the problems in the sixteenth century affecting the architectural structure itself. The latter most likely explain the long crack that runs across the painting at a slight diagonal. It begins in the lower center part of the fresco, splits in two at several places, and finally branches out into small cracks that end around the group of angels holding the column. As on the Ceiling, these cracks were sealed with a black putty of wax and hard resin, perhaps at the time of the intervention by da Volterra and Girolamo da Fano. The uneven and varied condition of the painted surface might suggest that the original painting has very much deteriorated. Instead we can confirm that for the most part Michelangelo’s fresco is preserved in excellent condition.

The group of angels blowing trumpets and holding up the book of the Last Judgment has suffered mechanical damage. The rings that held the metal supports for the baldachin, which until the middle of this century was normally raised above the altar for solemn occasions, can still be seen beside the angels. The poles used to raise the baldachin and the edges of the fittings themselves scratched and abraded the entire area, especially the angels on the right, and among these, particularly the one holding its trumpet on its shoulder. The black lines of the preparatory drawing are now visible in several of the damaged areas on the face of this figure.

The broad expanse of blue sky that serves as a backdrop for the protagonists of the Last Judgment presents an extremely complex and unique situation. Here the color is divided into zones, noticeably different in shape and tonality, by very light lines that follow the seams of the *giornate*, or days’ work. Scholars have often debated the possible reasons for these whitish lines, but no convincing solution has been offered. The most recent examination of the fresco revealed the significant fact that *secco* retouchings are present along the *giornate* seams; some of them may be original and others, because their color does not match its surroundings, are clearly restorations.

The sky was painted in fresco (color applied to wet plaster) with *lapis lazuli*, a precious yet extremely delicate pigment, and then finished *a secco* (on dry plaster) with the same color. Only a few traces of the finishing work remain, and they now appear almost black, caused in part by the dirt overlaying it and in part by the deterioration of their glue binder. The sky, for reasons explained above, is divided into several zones. The upper band is lighter and clearly defined below by the undulating line of *giornate* seams. The center band is darker and tends toward gray. The lowest zone, just above the horizon, is extremely light. The surface, as compact as slate, is almost entirely grooved by a series of generally horizontal brushstrokes. These are dense and fine above, but they become wider and very light until they are almost white where they touch the figures crowded on the earth below.

Originally it was thought that these bands, which have virtually no...
thickness at all (in the past this phenomenon was attributed to the action of lime that was not sufficiently spent), might be due to an application of an acidulated substance, brushed on during a cleaning in the seventeenth or eighteenth century (judging from the reports of Taia and Camuccini) to lighten the veil of foreign matter deposited over Michelangelo's sky and thus to reinforce the modeling of the figures. Moreover, since wine had been used to clean Raphael's Stanze and the Sistine Ceiling, it was also suggested that the agent responsible for the damage to the Last Judgment was an acidic wine, that is, one that was turning to vinegar.

Later investigations carried out in collaboration with Giovanni Torraca proved this hypothesis to be groundless. It was found that a weak acid like vinegar, which can be found in nature also in this form, cannot discolor lapis lazuli. Further research and observations seem to suggest that these bands are the remains, or better, the mark, of lost secco finishing work. Originally they must have been intended to strengthen certain areas of the sky and, especially at the bottom, to hide the seams between giornate. This finishing work must have had a certain thickness; it may have been lost in part during the seventeenth- and eighteenth-century cleanings and in part for mechanical reasons linked to the periodic dustings that continued until the middle of this century.

To the list of damages suffered by the blues we should add those suffered by the pigments applied a secco and those that were painted in fresco but
did not carbonize well and were therefore weak and not cohesive. In both cases past cleanings precipitated the loss of considerable quantities of color. The slight flaking of pigment in the areas repainted by Daniele da Volterra was caused, on the other hand, not by old restorations but by the contraction of the glue layer due to variations in the climatic conditions in the Chapel. The different technique Daniele used to apply his color was also a contributing factor.
The information we have about the painting of the Ceiling comes almost exclusively from indirect sources, most often Michelangelo's own correspondence. Payments for the Last Judgment, on the other hand, are numerous and provide extremely accurate information about Michelangelo's salary as well as about the pigments and scaffolding used. The payments for the scaffolding and the preparatory operations extended over more than a year, from 16 April 1535 to the end of April 1536. The length and difficulty of this period was due in large part, according to Vasari, to disagreements between Michelangelo and Sebastiano del Piombo. Vasari says that Sebastiano persuaded the pope "to have it done in oils, while Michelangelo did not wish to do it except in fresco. As Michelangelo did not declare himself one way or the other, the wall was prepared in Sebastiano's fashion, several months passed and nothing was done, but on being approached, Michelangelo declared that he would only do it in fresco, and that oil-painting was a woman's art and only fit for lazy and well-to-do people like Fra Sebastiano. Accordingly he removed the incrustation made by the friar's direction, and prepared everything for work in fresco."

Vasari's account is confirmed by the documents. The demolition of the "first plaster of the facade" took place on 25 January 1536, fully nine months after work began. The payment to the brickmaker Giovanni Fachino for the bricks to be used for the curtain wall in front of the altar wall was made on 13 February of the same year. The payments for pigments began on 18 May 1536 and attest to a series of acquisitions that continue later, during the period when the Pauline Chapel was painted. These orders for the disbursement of funds are rather general; they record the amount paid but not the specific color purchased. An exception is made for the blues, which are almost always the extremely expensive lapis lazuli, or ultramarine, purchased the first time in Venice and then in Ferrara, the native city of the commissar of papal works, Jacopo Meleghino, who handled all such payments. On 21 November 1537 ten pounds of azurite, called "azuro todescho" (German blue) in the documents, were ordered from Ferrara—the only exception, it seems, to orders for ultramarine.

The brick curtain-wall Michelangelo had built offered him a support
very different from the tufa of the Ceiling. It was laid at the beginning of
1536, and it projected almost 9 in. (24 cm) in front of the preexisting wall.
This is more or less the figure Vasari reported: "Michelangelo now caused
an addition to be made to the wall of the Chapel, a sort of escarpment,
carefully built of well-burnt and nicely chosen bricks, and projecting half a
braccio at the summit, in such sort that no dust or other soil could lodge
on the work." It seems unlikely, however, that this was the reason the wall
curved slightly outward. The optical effect it created is the more likely rea­
son, given the attention the artist paid to the foreshortening of his figures
and their complex placement in space, not to mention the characteristics
of the pentimenti.

As on the Ceiling, a layer of finer plaster, the intonaco, was laid over the
rougner arriccio, but here no final and even thinner coat of plaster, or
intonaching, was laid. The latter is sometimes replaced by a white or whitish
preparatory ground. The area of the sky was prepared with a thin glaze of
red ocher so light that it seems almost pink. The arriccio is about \( \frac{3}{4} \) in. (7
mm) thick, and the intonaco about \( \frac{1}{4} \) in. (4 mm); the plaster on the upper
parts of the lunettes is thinner since there is no under-layer of arriccio.
The plaster is made up primarily of pozzolana and lime in the propor­tion of three to one. (This information can be traced back to Federici; the
higher value refers to the inert material.) On rare occasions the days' work
intended for figures were prepared with marble dust, evidently to give
them a smoother and more compact surface. For the most part all the
intonaci are very finished and compact—or stretti (literally, "pressed"), to
use restorers' jargon. This phenomenon is very easy to see in raking light.

According to Biaggietti the fresco was painted in 450 giornate. This figure
will have to be revised since there are many giornate in the lunettes, where the number of days' work has already been checked, which were not recorded on Biagetti's diagram.

The technique used to paint the Last Judgment—once Sebastiano's suggestion that oil be used was rejected, at least initially—was, as on the Ceiling, true, or buon, fresco. Yet the two paintings were conceived and executed in very different ways: the brushstrokes, the range of colors, the use of secco during the execution of the work, and the preparation of the intonaco itself, already discussed above. The Last Judgment has none of the limpid, transparent colors of the Ceiling, and the liquid brushstrokes and glazes of color on the Ceiling are abandoned in the Last Judgment for richly colored impastos painted with heavy brushstrokes that are always quick and rough. The technique of preparing the shaded areas of the figures with terre verte, or verdaccio, was rarely used on the Ceiling and does not appear at all in the Last Judgment. The use of localized brown tones to prepare whole images for painting (the figure is then modeled with highlights and halftones) continues from the Ceiling and is used perhaps even more frequently in the later painting.

The number and scope of the corrections, additions, and secco finishing touches are noteworthy. The latter were often executed after several days, although never by scraping off the plaster, as was the case on the Ceiling. The pentimenti include moving and increasing or decreasing the size of some parts of a figure, sometimes substantially. In some cases they are intended to modify or even add areas of highlight. Unlike the pentimenti on the Ceiling, which adjusted the proportions of single details, correcting their dimensions, those on the Last Judgment were made predominantly for
dynamic and perspectival reasons and alter the figures' arrangement and sense of movement. The *pentimenti* on the angel holding the column and on the Elect Soul between Christ and St. Peter are typical. In both cases the figure's head has been turned toward the left shoulder and depicted in full profile, significantly changing the original relationship between head and shoulders and therefore the entire composition of the figure.

Following the normal technique, the elements—trumpets, for example—that cross several *giornate* were painted *a secco*. The same is true for pigments that could not withstand the causticity of the hydrated lime; this seems to be the case for the yellow area behind Christ. Numerous finishing touches lost in past restorations were, presumably, also executed *a secco*. They would have made less obvious the shifts in tone visible today in the broader expanses like the sky and in places where adjacent *giornate* were painted sometimes even months apart. Such finishing touches might also have masked the *giornate* seams that are now so evident. If this were the case, then they have been lost, in part because of past restorations and in part because of the combined action of flaking, due to the *contracting layer* of glue, and abrasion caused by frequent dustings.

The reddish-brown outlines of figures added in the background, frequently painted over several *giornate*, were also executed *a secco*. These were apparently not present in the cartoon, in which, given its dimensions, Michelangelo included only the principal figures. Yet they have an essential function in that they consolidate the structure of the composition by com
The pigments identified up to this point, together with the technique with which they were used, document Michelangelo's increased pictorial sensibility, brought about, no doubt, by his contact with Venetian painting and his close relationship with Sebastiano del Piombo. The addition to his palette of lake, azurite, and possibly giallòlino and orpiment is particularly important in this sense, as is the use of azurite for a specific purpose and not as a substitute for the more costly lapis lazuli (on the Virgin's mantle and the lower part of the sky). Significant, too, is the choice of lapis lazuli for the intense blue of the sky that is so important for the overall effect of the fresco. The choice of the extremely expensive ultramarine must also

Michelangelo's palette on the Last Judgment was somewhat different from that of the Ceiling. Mars brown and yellow, lead orange and ivory black, which were used only in the early phases of work on the Ceiling, were not used on the altar wall. For the blues, Michelangelo no longer used blue smalt, or smalto; he substituted lapis lazuli and small quantities of azurite. On the other hand we find red lake and perhaps (if the laboratory analyses confirm it) giallòlino and orpiment on the altar wall—colors that either cannot be used or are only rarely employed (in the case of giallòlino) in fresco.

Completing it and, more important, by giving it a greater sense of depth. They were executed only after the principal figures, and they were painted with a rapid, sketchlike technique that creates the impression of a progressive blurring of the image. This technique is characteristic of Michelangelo's style since the Sistine Ceiling. Typical examples are the sketchy figures in the background of the right lunette who hold the ladder, the pole, and the sponge.
have been influenced by the fact that the expenses of the Last Judgment, unlike those of the Ceiling, were all covered by the pope. From an economic point of view, moreover, Michelangelo had no more worries; he was part of the papal household and his salary was covered, as we know from two briefs and from the payments that continued until his death.

As has been noted, a cartoon was made for all the principal figures; it was surely precedecl by small compositional drawings and perhaps, as on the Ceiling, by studies drawn directly on the arreccio, although no evidence for them has yet come to light. On the upper part of the Last Judgment the cartoons were transferred to the plaster by pouncing, or spolvero, and the paper used seems to have been quite thick, since in some cases the edge of the small perforations left a circular mark on the plaster. On the lower part of the fresco, executed at the end of the project, the method of transfer changed to indirect incision, a technique Michelangelo had used in the later narrative scenes on the Sistine Ceiling.

Beyond any actual economic considerations which may in a secondary way have influenced some of his choices, the artist who emerges from the tests and cleaning so far completed is tied technically, as was obvious, to the canons of buon fresco. Yet he is also more a painter than the artist who executed the Sistine Ceiling, one capable of using color and light in ways that seem not only to follow but also to anticipate Venetian techniques.
Last Judgment, detail of the Elst below the left lunette, photographed while the cleaning was in progress. The area where had not yet been cleaned can be seen clearly in the foreground.
The preparatory phase of the restoration of the *Last Judgment*, intended to determine the fresco’s condition and Michelangelo’s technique as well as to develop the best method for the cleaning, took more than a year. It included both laboratory research and *in situ* tests.

The method of cleaning being used was developed with two essential requirements in mind. The first was its capacity to adapt itself to the different technical and conservation situations encountered across the surface of the fresco without changing the degree of cleaning, which must remain constant for the entire painting. The second was its capacity gradually to reach a predetermined level, thus allowing for the possibility, given the unevenness of the fresco’s state of conservation, of leaving behind some part of the veil of foreign matter in order best to balance the result of the cleaning.

In the procedure designed according to these requirements, the fresco is first washed with distilled water alone and then treated with a solution of water and ammonium carbonate (at twenty-five percent), with an intermediate phase where the diluting agent is potassium nitrate. Twenty-four hours later the ammonium carbonate solution is applied again, this time through four layers of Japanese paper. This treatment lasts between nine and twelve minutes, after which the paper is removed and the area is washed with a small, sterilized sponge soaked with the same ammonium carbonate solution. The fresco is then washed several times with distilled water. This method has produced excellent results on the figures, but a slightly different technique has been used to clean the sky. The ammonium carbonate was applied for a shorter time, and, since the pigment cannot be cleaned even with a very soft brush, the removal of foreign matter was effected with a blotter—a sponge soaked in water is laid against the painted surface so that when it is pressed and released it lifts the dirt from the color without creating any friction. Since the effectiveness of this method, developed after a long series of tests, depends largely on the restorer’s manual skill, the cleaning of the sky was entrusted to a single individual.

The areas painted *a secco* can be cleaned in the same way as the sky.
When these areas are covered by retouchings, however, the retouchings must be removed first, using specific solvents and very small brushes. All the water used in the cleaning process and for the final washing is first sterilized in the research laboratory. Among the retouchings are the loincloths discussed above. A definitive decision concerning them will be made at the end of the restoration, and in the meantime we hope to clarify the question of their chronology. The repainted figures of Sts. Blaise and Catherine will obviously remain, since they were executed in fresco and cannot be removed. Furthermore, according to a standard now universally accepted by restorers, anything that constitutes a historical document rather than irrelevant information is preserved, as in the case of the fig leaves in the Brancacci Chapel in Florence.

No protective substance will be applied to the painted surface at the end of the restoration so as not to superimpose foreign and perishable material on the original pictorial fabric. Instead, a system designed to filter the air and regulate the microclimate of the Chapel has been installed. The climate control is regulated by a sophisticated monitoring system linked to sensors placed on all the walls as well as the ceiling of the Sistine Chapel. At the time of this writing, the restoration is scheduled to be completed by the spring of 1994.

### The Palette of the Last Judgment

**Whites:** Lime white (hydrated calcium carbonate)

**Yellows:** Yellow ochers of various tones (earth silicates more or less rich with hydrated ferrous oxide)
- *Giallofiino* (lead oxide and tin oxide)

**Browns:** Umber (ferrous oxide and manganese dioxide)
- Burnt sienna (earth silicates and hydrated ferrous oxide)

**Blues:** Lapis lazuli (aluminum and sodium silicates containing sulphur)
- Azurite (basic copper carbonate), in small quantities

**Reds:** Red ocher (anhydrous ferrous oxide)
- Red lake

**Greens:** *Terre verte* (ferrous silicates)
- Malachite** (basic copper carbonate)

**Blacks:** Vine black (black obtained from burning grapevines)

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* This pigment was found in only one place. Further tests must be run to confirm its presence.

** Malachite is present only in St. Catherine's dress, which, however, is part of Daniele da Volterra's repainting in true fresco.
Last Judgment, detail of the right lunette after it was cleaned. The small figures with the ladders of the Crucifixion were added in secco.