

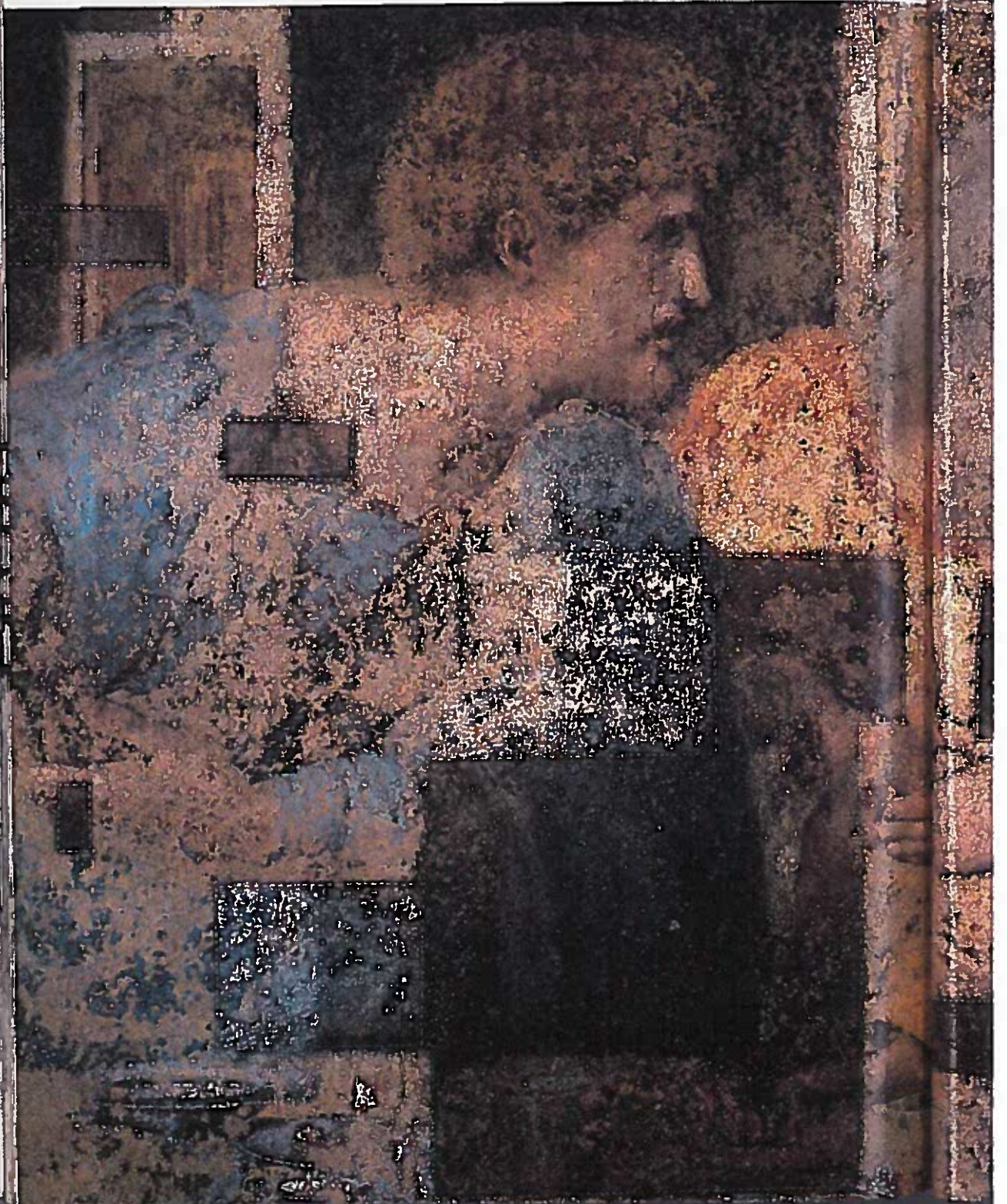
*Restoration  
reveals*

# THE LAST

664

By CARLO BERTELLI Photographs by

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NATIC





# T SUPPER

by

VICTOR R. BOSWELL, JR.  
NATIONAL GEOGRAPHIC PHOTOGRAPHER

*Masterpiece reborn, Leonardo da Vinci's "Last Supper" comes to light—patch by patch—after five centuries of abuses by man and nature. This restored section shows Apostles Matthew, Thaddeus, and Simon.*





**I** SEE A MAN, an artist of some 40 years, arguing with lawyers in a piazza of Renaissance Milan. The duke's patience wears thin, says one lawyer. There are contracts, says another, and deadlines that have passed. Perhaps, suggests a third, the famous Leonardo da Vinci has taken on too many projects. Casting of the great bronze horse, a monument to Duke Ludovico Sforza's father, has not yet begun. Plans for new weaponry are due. Can not Leonardo speed up his work in the dining hall of the Dominicans? Why does that painting of the "Last Supper," the duke's gift to the friars, take so long? Why, Leonardo, do you dabble with oils and resins when the faster fresco techniques are so well proven?

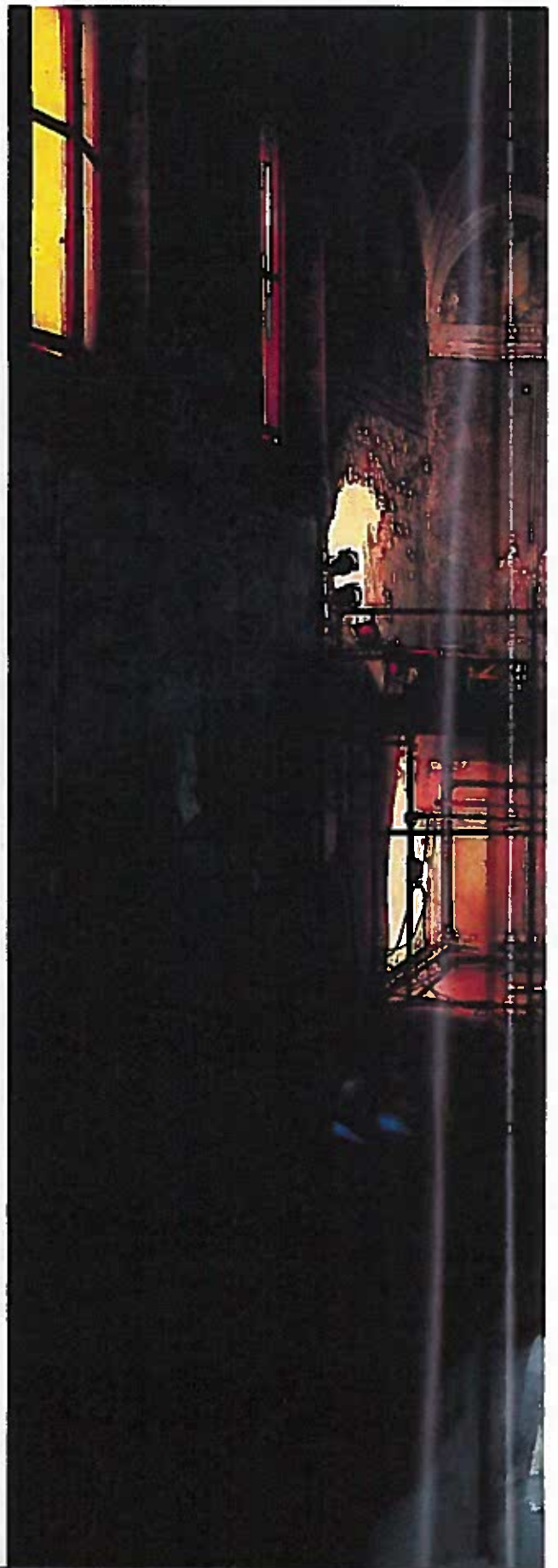
Abruptly, I see Leonardo break away. He is distracted by a passing face. The stranger's nose and chin line have a classic grace. The eyes bear a sadness and pathos he has struggled for weeks to sketch.

Leonardo pursues the stranger through the winding streets of Milan. Summoning his powers of concentration, the artist memorizes details of the man's face and carriage. At last he has solved the crisis of visualizing the Apostle James the Younger. Leonardo will not rest now until he can reproduce those details on the wall of the Dominican refectory, or dining hall.

Five centuries have passed. Once again scaffolding obscures that monastery wall. This time the scaffolds are there to salvage perhaps the world's most abused masterpiece. For the past six years it has been my job, as superintendent of fine arts in Milan, to help coordinate this rescue operation.

Now, when I visit the monastery of Santa Maria delle Grazie, I see a woman. Her concentration must at times rival Leonardo's. The woman, Dr. Pinin Brambilla Barcilon, works at a microscope about the size of a dental X-ray machine. As Dr. Brambilla moves it up and down, it magnifies by as much as 40 times *(Continued on page 676)*

*As in Leonardo's day, visitors flock to admire his wall painting in this former refectory of a monastery in Milan, Italy. Lunettes display crests of the Sforza family who commissioned the mural, under repair since 1977.*











***"One of you shall betray me." Turmoil disrupts the Passover table as the twelve disciples react to Christ's forewarning. In capturing this moment before the traitor is revealed, Leonardo plumbed a psychological depth unknown in previous***

***paintings of the Last Supper and heightened the drama by grouping the Apostles in threes.***

***From the left, behind a humidity monitor, are Bartholomew, James the Younger, and Andrew. Judas, shadowed***





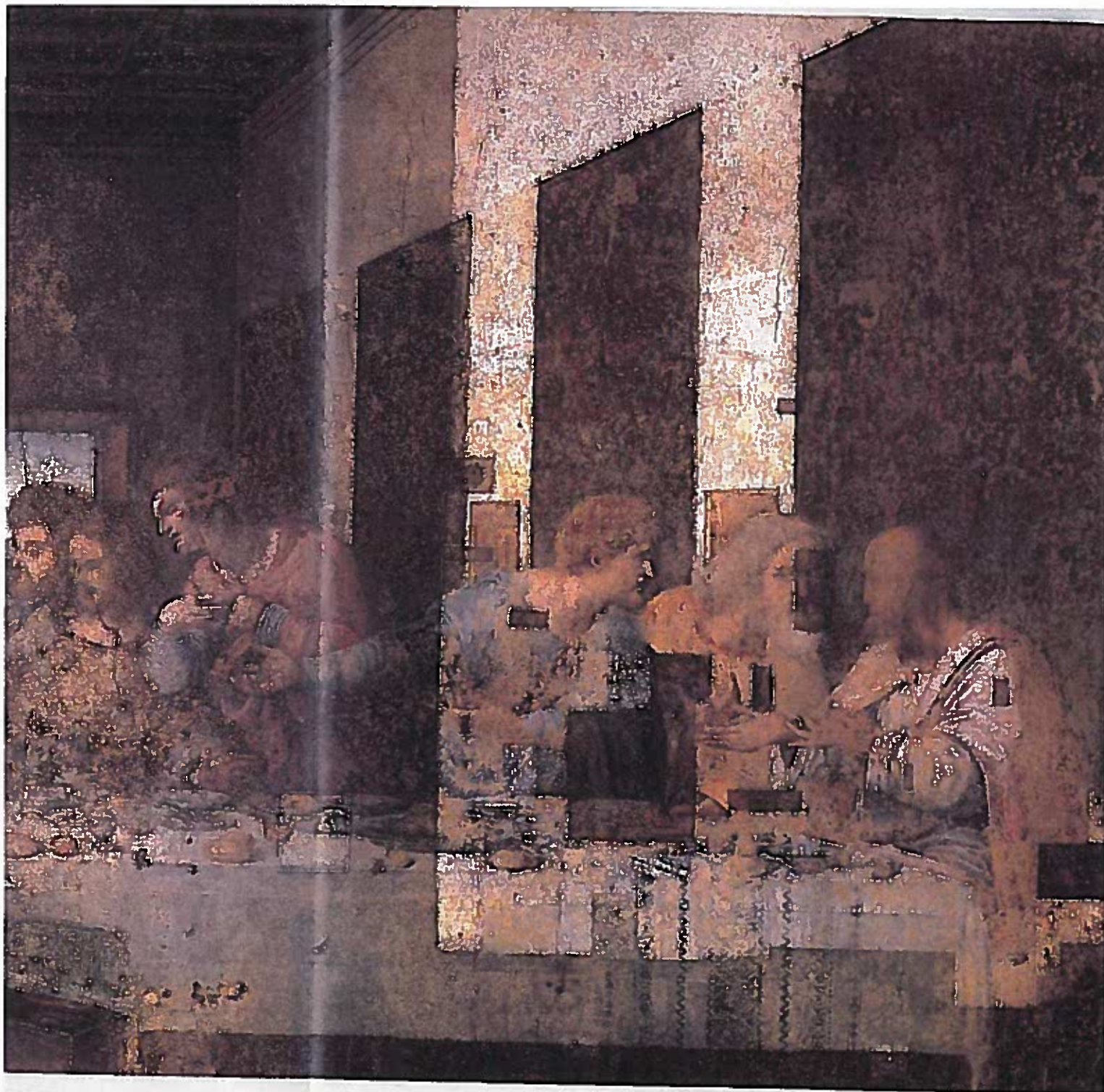
Supper and  
by grouping the  
and a humidity  
new, James the  
Judas, shadowed

in guilt, clutches his betrayal fee, while  
Peter whispers to John, "Tell us who it  
is of whom he speaks." Thomas, his  
finger raised; James, brother of John;  
and Philip ask, "Is it I, Lord?" The now  
luminous Matthew, Thaddeus, and

Simon confer below tapestries hanging  
on newly revealed hooks and nails.  
Scientist as well as artist, Leonardo  
devised an extraordinary accelerated  
perspective, converging all lines in the  
painted room on Jesus and riveting

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POLAROID CORPORATION (OVERLEAF)

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attention on the figure isolated in a  
halo of window light.

Historians date the Italian High  
Renaissance to this monumental work,  
painted about 1495-97. It began to  
decay within a decade. By 1652 it was

presumed lost, and the friars enlarged  
a door through Christ's feet. His face  
(overleaf), shown here in the size it  
appears on the mural, bears heavy  
repainting from past restorers. Its  
cleaning will culminate this restoration.



## Bringing Leonardo back to life

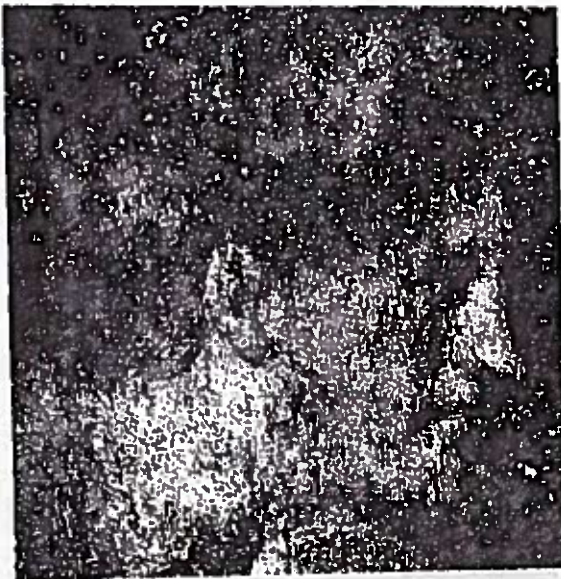
**“YOU HAVE TO THINK** like the artist,” says restorer Dr. Pinin Brambilla Barcilon (right) as she searches for the heart of the “Last Supper.” “What you see of the painting is largely the invention of past restorers,” she explains. “What we are bringing to light will be truly by Leonardo’s hand.”

Leonardo’s experimental painting technique quickly proved unstable, and much of his original pigment is now lost. Six major restorations since 1726 usually did more harm than good, repainting the mural in somber tones, darkening it with oil, anchoring pigment with dirt-collecting glue and wax, and destroying Leonardo’s paint with harsh solvents. One restorer even signed his name. But the last restorer carefully anchored the paint after World War II; without his effort even less would remain today.

Dr. Brambilla’s artistic surgery proceeds with excruciating slowness and care. After three years of testing, the restorer has spent three years cleaning the lunettes and the right quarter of the mural, thought to be the least damaged. She first examines a small area through a microscope, enlarging the paint fragments as much as 40 times. She then applies specially developed solvents, and blots quickly before the chemicals reach Leonardo’s colors (far right).

Delicate details return: A once obscured object becomes a lemon slice reflected on a pewter plate (right). “If Leonardo gave this attention to the table setting, you can imagine what his figures once looked like,” says one Leonardo scholar.

The transformation of Matthew (left, top to bottom) brings us closer to the artist’s concept. The black-and-white photograph records his condition after a turn-of-the-century restoration. With cleaning, his countenance re-emerges. Dr. Brambilla works in chalk-marked patches to compare different areas. Completed, Matthew regains his classic profile, and his mouth is once again open in speech. Where none of Leonardo’s pigment remains, Brambilla paints a neutral, easily removed watercolor, seen in Matthew’s hair.



SOPRINTENDENZA PER I BENI ARTISTICI E STORICI (TOP); POLAROID CORPORATION (ABOVE)





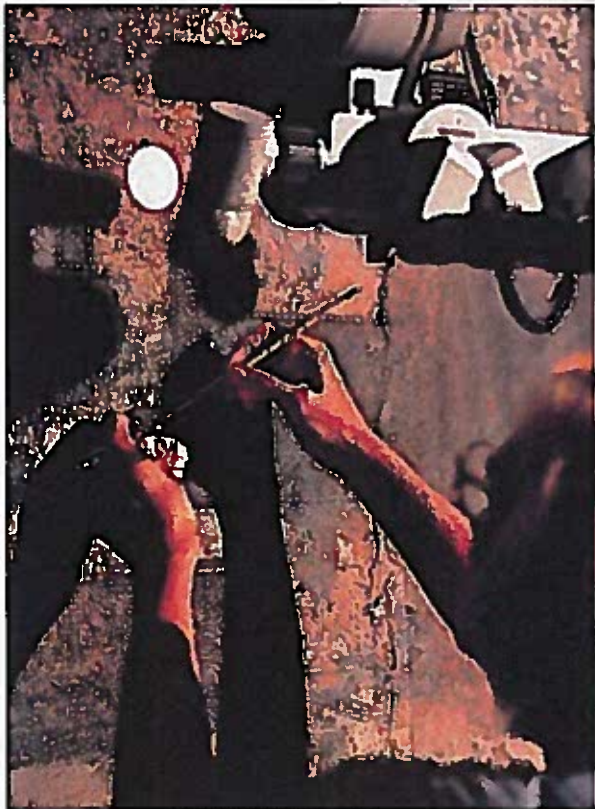


© LOUIS MAZZATEWA, NATIONAL GEOGRAPHIC STAFF (BELOW RIGHT AND ABOVE)

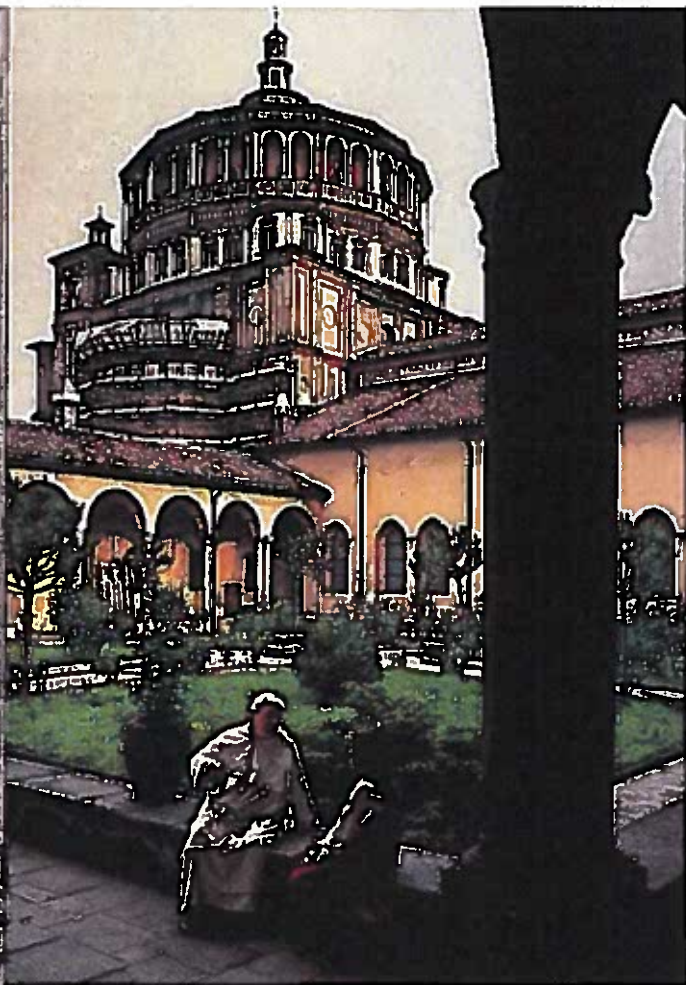


*Researchers are still attempting to discover the composition of Leonardo's paints. Italy's Olivetti Corporation provides funds and equipment for that work as well as for the restoration. The Polaroid Corporation provides photographic documentation. Time estimates for completing the project range from three to five years.*

*Restoring the "Last Supper"*







*"Even in disaster there was good luck," reflects Father Angelo Caccin (left), speaking with a visitor at the Dominican monastery of the Church of Santa Maria delle Grazie. A World War II bombing ravaged the complex in 1943, but spared*

(Continued from page 666) particles of the paint Leonardo applied in the 1490s.

Like Leonardo, Dr. Brambilla works with a paintbrush, along with a scalpel and a surgeon's skill. She is cleaning and scraping away 500 years of dirt, glues, and mold, as well as many layers of overpainting by zealous previous restorers.

Those restorers added their own idiosyncratic embellishments to Leonardo's masterpiece. They have darkened the painting, destroying the bold and brilliant colors. They have changed the lines of the Apostles' faces and obliterated much detail. The face of Christ, the magnetic central focus of the painting, is a mere mask. No one knows for sure what features Leonardo conceived for Jesus. We suspect also that Judas has been given more devilish features. This current

restoration is, in a sense, an excavation. The true "Last Supper" lies buried beneath centuries of overpainting.

**T**HE "LAST SUPPER" has been assaulted by more than restorers. Its problems began almost with its inception. Some experts maintain that Leonardo betrayed himself by using the wrong technique. Murals such as the "Last Supper" were traditionally done in fresco. In that method, paint is applied directly to wet plaster, so that color and plaster become one. A fresco painter must work very quickly, but working quickly was exactly the opposite of what Leonardo wanted to do. Further, the fresco technique would have limited the types of paints Leonardo could have used. We know he experimented with

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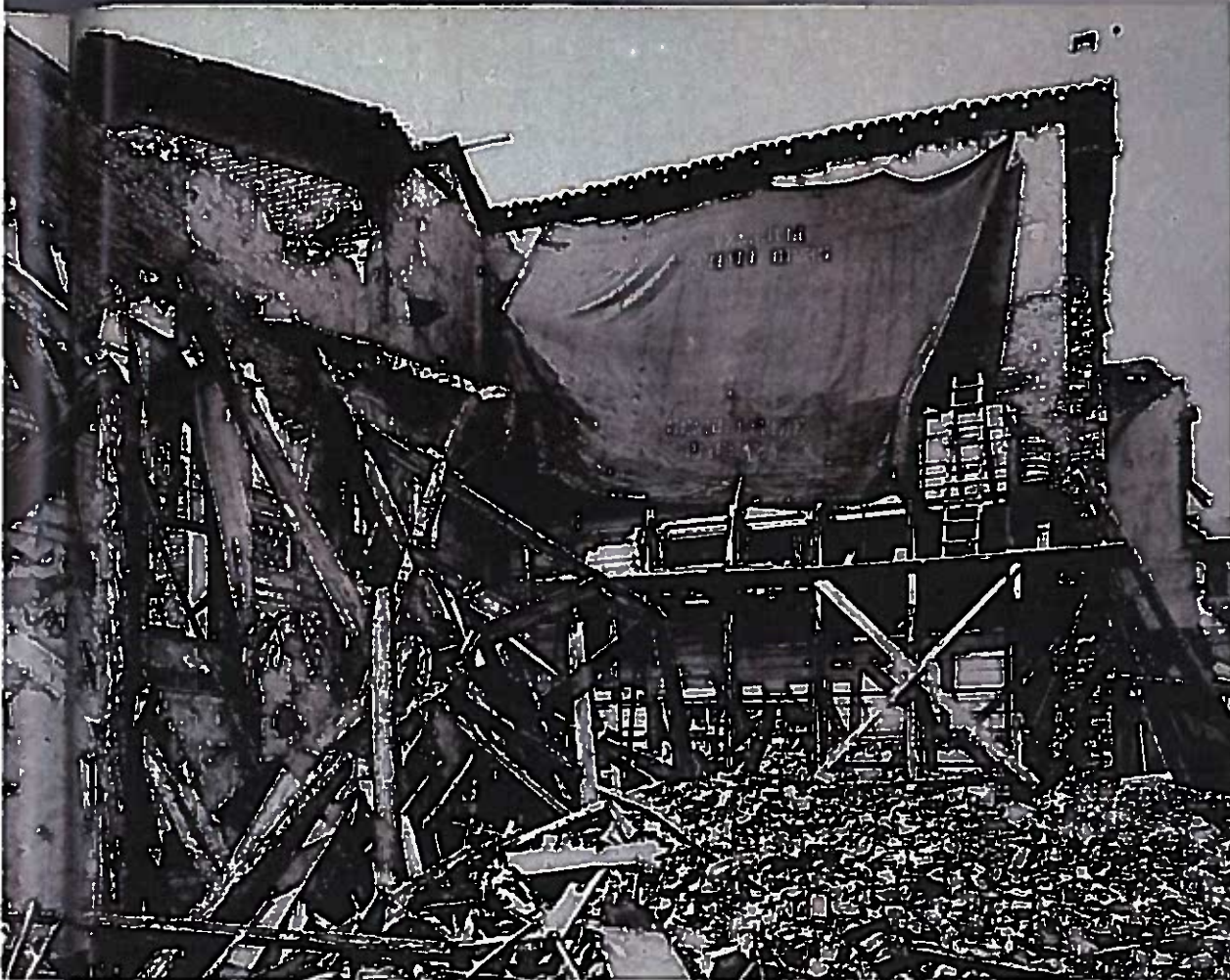
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SOPRINTENDENZA PER I BENI ARTISTICI E STORICI

the church dome by Renaissance architect Donato Bramante and—amazingly—the “Last Supper” (above). The wall had been braced with steel and the painting covered with the boards and sandbags seen below the tarpaulin.

a rich but still poorly understood variety of paints to achieve the innovative colors of the “Last Supper.”

To free himself from fresco’s limitations, Leonardo had the freshly plastered wall of the dining hall painted with lead-white primer. When this priming dried, he proceeded to paint at his own pace and with the paints he preferred.

The Renaissance writer Matteo Bandello, who in his teens observed Leonardo, gives us some idea of how the artist worked on the “Last Supper”: “Many a time I have seen Leonardo go early in the morning to work on the platform before the ‘Last Supper’; and there he would stay from sunrise till darkness, never laying down the brush, but continuing to paint without eating or drinking. Then three or four days would

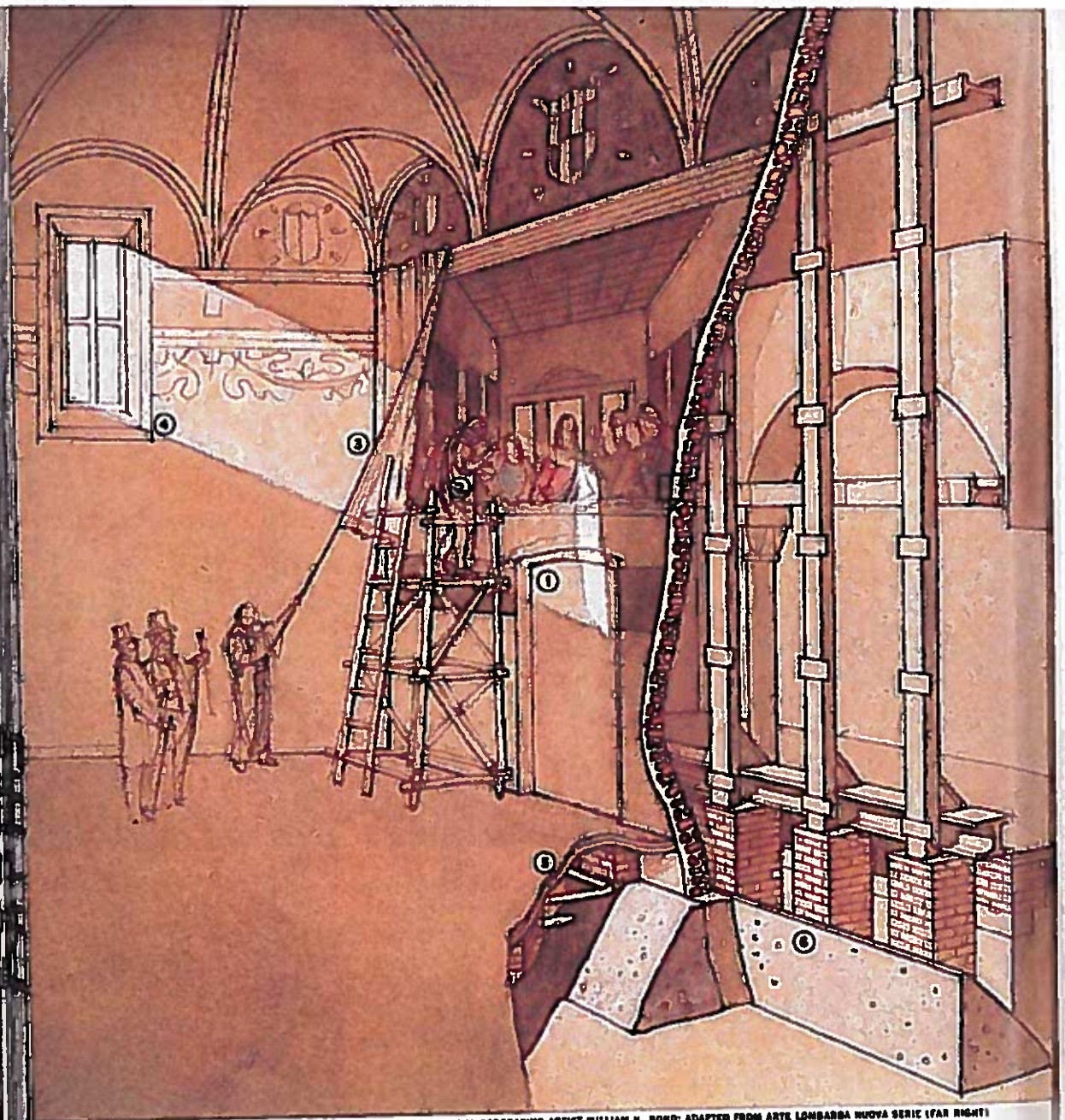
pass without his touching the work, yet each day he would spend several hours examining it and criticizing the figures to himself.

“I have also seen him, when the fancy took him, leave the Corte Vecchia when he was at work on the stupendous horse of clay [that is, the model for the gigantic bronze equestrian monument to Ludovico’s father that was never cast] and go straight to the Grazie. There, climbing on the platform, he would take a brush and give a few touches to one of the figures: and then suddenly he would leave and go elsewhere.”

The priming technique that gave Leonardo the luxury to deliberate, some contend, was too experimental. Indeed, the priming cracked, and even in Leonardo’s lifetime the paint began to flake.

The technique Leonardo used was not





PAINTINGS BY NATIONAL GEOGRAPHIC ARTIST WILLIAM H. BOND; ADAPTED FROM ARTE LOMBARDA NUOVA SERIE (FAR RIGHT)

**Portrait of destruction, this drawing (above) condenses misfortunes the "Last Supper" has suffered and reveals modern corrections. (1) A door was enlarged in 1652. (2) Half a dozen well-meaning restorers seem to have been its worst enemies. (3) A protective curtain hung by friars in 1768 trapped humidity and abraded the mural when opened for visitors. (4) To ward against sunlight, nearby windows are now boarded. Post-World War II rebuilding added (5) central heating to stabilize winter temperature and humidity and (6)**

**strengthened foundations.**

**The downfall of the "Last Supper" began with its creation. Most murals were painted quickly and directly on wet plaster. But Leonardo had plaster covered with lead-white primer on which he could paint slowly. A wall diagram (near right above) shows the layers of paint, primer, plaster, mortar, and brick. Why his method failed is still unclear. Perhaps humidity affected the plaster so that primer and paint could not adhere.**

**A cradle of steel behind the mural**

*National Geographic, November 1983*



unknown, and he was simply too careful a man to experiment recklessly. I suspect that nature was also a culprit behind the decay of the "Last Supper." Consider that the years during which Leonardo was painting had exceptionally dry winters. We know, for instance, that the nearby Alps were free of snow. So the plaster may have dried faster than usual, causing the priming to crack easily, and the paint along with it.

Although the "Last Supper" was immediately acclaimed upon its completion in the late 1490s, by 1517 it was known to be flaking. Several large-scale copies were completed during Leonardo's lifetime, including at least two by his students. King Francis I of France ordered a copy, as well as a tapestry version, as a gift to the pope.

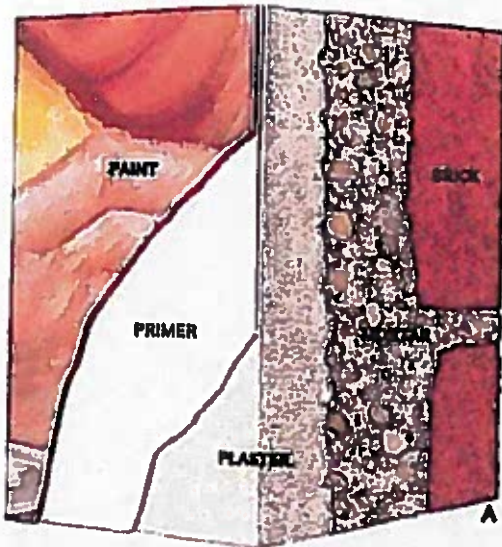
By 1587 the painting was described as "half-ruined." In 1652, perhaps because the

friars thought the "Last Supper" was lost, they enlarged a small door beneath the mural. In doing so, they cut off Christ's feet.

Still the painting remained one of the most celebrated works in Europe. In the 18th century the friars put a curtain over it, which they would pull open for visiting dignitaries. The curtain, of course, scratched the flaking mural. It also trapped humidity. In fact, 18th-century reports allege that "rivulets of water" ran down behind the curtain.

About the same time, the friars initiated the first so-called restoration. In 1726 they engaged a painter, Michelangelo Bellotti, who was almost unknown, to repaint the original entirely. His work proved so incompetent that another painter, Giuseppe Mazza, was asked in 1770 to remove Bellotti's overpainting with a scalpel.

A visiting Irish artist, James Barry, saw



wall (right) supports sensors that record vibrations set off by changes in temperature and humidity. Air conditioning is needed to control such shifts as well as pollution and mold. At the level of the lunettes, architect Roberto Cecchi, left, consults with Lionello Costanza Fattori, director of the agency in charge of the wall. The author heads the department responsible for the painting, while another group monitors the building. Wall cracks detailed here (above right) have been largely contained.

*Restoring the "Last Supper"*





the damage Mazza's scratching was doing and protested vehemently. His protests were probably what convinced the Dominican prior to halt Mazza.

Perhaps the painting's low point occurred in 1796, when Napoleon's troops occupied Milan. They used the refectory as an armory and a stable. French soldiers threw stones at the Apostles and even climbed ladders to scratch out some of their eyes.

That desecration was an excuse for more overpaintings and restorations, which continued into this century. Then, in 1943, an Allied bomb landed next to the dining hall. Miraculously the wall, which had been sandbagged as a precaution, survived. But had the bomb landed one meter closer, the painting probably would have been lost. "The bomb," says the Dominican's current prior, Father Angelo Caccin, "was more intelligent than humans."

Although the dining hall has been rebuilt, one cannot enter the hall today without a sense of dismay. Modern life continues to assault the "Last Supper." Milan's dirty air

corrodes and besmudges the painting. Fluctuations in humidity afflict the wall. Mold grows on remaining flakes of paint. As Father Caccin says, "The 'Last Supper' is the most important dying thing in the world."

But like physicians unwilling to let a patient die, we are making a last stand. Funded largely by the Olivetti Corporation, we are attempting a true restoration of the "Last Supper." We must accept that much of Leonardo's masterwork is irretrievably lost. We want to salvage what is left of the original by removing the overpaintings and the dirt, even though that means that part of what we now see will be lost.

"We no longer have the 'Last Supper' of Leonardo," one expert has said. "It's better to have a little bit of Leonardo than all of this 'Last Supper.'"

**E**VEN THOUGH MUCH of the painting is altered, the greatness of Leonardo's concept still emanates from that special wall at Santa Maria delle Grazie. Leonardo was a master of perspective.





He designed the ceiling of the room in his "Last Supper," the tabletop, and the height of the figures all to give anyone in the dining hall the feeling of dining with Christ and the Apostles.

"Last Suppers" were common Renaissance paintings. Practically every monastery dining hall had one. What drew such an innovative man as Leonardo to this subject? For one, it offered a vehicle for themes that interested him.

Consider that, for the first time in a rendering of the Last Supper, Christ is completely isolated. Usually John, commonly identified as the Apostle especially beloved, has his head on Christ's shoulder or lap. Leonardo's Christ has an aura of loneliness surrounding him, perhaps akin to the isolation of the creative genius.

Also, Leonardo clearly was fascinated by the potential to explore the concept of betrayal. The scene takes place just as Christ has announced that someone in the room shall betray him. Leonardo wanted to show the reactions of 12 men to that statement.

Because each is asking if he is the betrayer.

The painting is psychologically sophisticated. It is not theatrical. The drama all lies within the characters. Our restoration is beginning to reveal more of that inner drama.

We are fortunate. We now have numerous new technologies, and, like doctors with a dying patient, we can use them to give the "Last Supper" a thorough examination.

This physical was begun in the early 1970s by my predecessor, Franco Russoli, who died suddenly of a heart attack in 1977. When I arrived from my previous position in Rome, the wall was still so dark and dirty that large parts of the painting were almost invisible. Dr. Brambilla had accomplished only a small part of her cleaning.

I was, and still am, shocked at the simple way the painting is kept—with no protection from humidity or pollution. Moreover, the central heating at that time worked only during the day. This provoked daily temperature shock treatments when the heat went on and off.

In Italy, however, we have bureaucratic



*Scholar of anatomy, Leonardo drew meticulous studies for the "Last Supper." The few still in existence help guide today's restoration. Peter's arm and hand remain similar in sketch (above) and painting (left). But Judas varies from his chalk portrait (right). Early restorers probably altered his features and added to his beard to cover lost paint.*



BY PERMISSION OF QUEEN ELIZABETH II (LEFT AND BELOW)



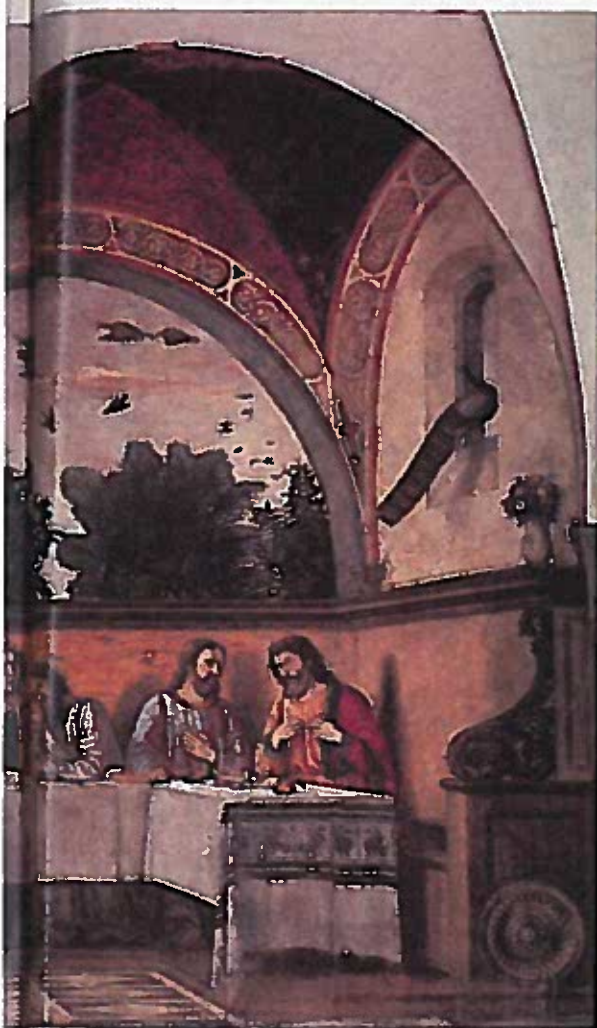


**Leonardo revolutionized portrayals of the Last Supper, which traditionally isolated Judas on the opposite side of the table, as in**

**this 1480 fresco (above), painted by Domenico Ghirlandaio for a convent in Florence. Even Leonardo's preliminary sketch (below) follows**







SCALA (ABOVE); BY PERMISSION OF QUEEN ELIZABETH II (BELOW)

*this earlier practice. The group at right details John, leaning against Christ, Peter, and Judas, rising from his chair.*



*Restoring the "Last Supper"*

divisions that can slow progress. For instance, my office has only the responsibility for the painting itself. Other superintendents are responsible for the wall on which it is painted, and for the climatic conditions in the dining hall. It often takes a long time to get everyone to agree on any action.

Nevertheless, we have begun. The physical examination of the "Last Supper" is well under way. We are trying to learn all the possible causes of its deterioration.

**O**UR PRIMARY GOAL is to describe the painting and its environment in scientifically accurate terms, to create a data bank for future generations as well as today.

We have applied stereophotogrammetry, the technique cartographers use in making aerial topographical maps, to create in essence a relief map of the paint on the wall.

Using ultrasound, we have made a profile of the thickness of the wall at some 200,000 different points. We can resolve differences in thickness to a tenth of a millimeter. This lets us find little craters and pick out places where the priming is lacking and only bare wall remains.

With hygrometers, infrared cameras, and electronic sensors we have made detailed temperature and humidity profiles. We hope sophisticated new techniques that detect radioactive isotopes will reveal whether there is humidity between the layers of paint, the priming, and the mortar.

We have applied X-ray and ultraviolet techniques that can identify the minerals used in Leonardo's pigments. It is partly a way of discovering his craftsmanship. Did he use, say, violet or blue to achieve a particular shading effect? If blue, we can then ask what sort of blue. These techniques also help us determine which paints are Leonardo's. Some minerals, for instance, were not used in pigments in Leonardo's day.

So what have we learned?

For one thing, we have determined that the wall is not uniformly thick. It varies in thickness from 35 to 40 centimeters (14-16 inches). For its height it is a very thin wall.

We have learned that this wall is very sensitive to temperature differences. There is a small room behind it, and temperature differences between that room and the main



*The spirit of Philip in Leonardo's sketch still speaks through a veil soon to be lifted. Though the painting was in ruins when the artist Rubens saw it in the early 1600s, he said of Leonardo: "By the fire of his imagination . . . he exalted divine things through human things and was able to lend men every degree of worth up to the heroic."*



BY PERMISSION OF QUEEN ELIZABETH I (ABOVE); POLAROID CORPORATION (FACING PAGE)

dining hall can sometimes cause parts of the wall to oscillate a fraction of a millimeter. These microearthquakes can cause bits of paint to flake off.

Humidity differences between the two rooms are just as destructive. The porous wall allows humidity to pass back and forth between the rooms. Water can thus condense on the painting. These microscopic drops can leave deposits on the surface as they evaporate.

We have also seen large changes in temperature and humidity as big groups of tourists enter and leave the hall. Tourists also bring in microorganisms and dirt on their shoes. We know now we need a very advanced air-control system for the hall.

Dr. Brambilla already has made many exciting discoveries, even though less than

one-third of the "Last Supper" has been cleaned.

The dingy colors have given way to the daring and brilliant palette of Leonardo. Exquisite details are emerging in the still life on the table and in the wall decorations surrounding the painting. The most impressive changes, however, concern the Apostles.

Simon's nose turns out to be much smaller than we thought, and his beard is far less jutting than before. He now has a strong chin, and his neck is positioned so that he clearly is talking to Matthew and Thaddeus. Before cleaning, his garments were a dull brown. Now they are three colors: deep red, rose, and icy white.

"Matthew's mouth was closed," Dr. Brambilla tells me. "Now it's open, and he is breathing. He no longer has a beard. His nose has become straighter and more classical. His neck is as graceful as a bird's now. It reflects the true lines of Leonardo. Matthew's lips have become very sensual and beautiful. He is filled with emotion. Personality is emerging in the Apostles."

**H**OW LONG will it take for the entire new "Last Supper" to emerge? Dr. Brambilla just sighs at that question. It takes her a week to clean an area the size of a postage stamp.

"It's difficult," she says. "The work is hard and tiring. It creates much physical tension bending over the microscope. After a few hours my eyes grow blurry. I may come every day for months. Then I must take an extended break. There is also the psychological tension. All the eyes of the world that know Leonardo are watching what I do. Some nights I do not sleep."

Much of the wall, Dr. Brambilla has found, has totally lost any remnant of Leonardo's paint. There she applies beige or gray watercolor, a neutral background that enhances what remains of Leonardo.

Future generations may debate whether to repaint some of that neutral region, to try to recapture Leonardo's original vision. We certainly do not yet have the wisdom to make such an attempt. What we do in the coming years will provide at least some of the knowledge required. More important, it will give those future generations a "Last Supper" that still lives. □



