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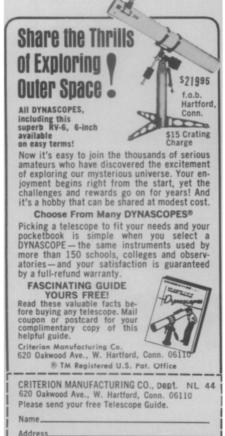
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Cleaning up a Queen's Complexion The beauty of Venice, Queen of the Adriatic, is far more than skin-deep. Many of her buildings are masterpieces of medieval and renaissance architecture. They're embellished with esthetically priceless statuary and other sculpture. And it's all being blackened and eroded by smog from suburban industry. Even works of art that are housed within the public buildings and palazzi of this magnificent city are under attack. Conventional cures, such as chemical solvents or sand-blasting, threaten to do more damage than the disease itself.

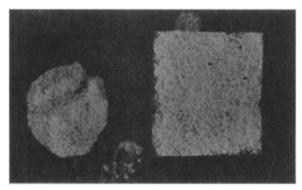
Recent experiments show, however, that a laser beam can be used to remove pollutants and reveal the natural stone or wood finish beneath. This hopeful discovery was a by-product of a joint effort by TRW's Dr. Ralph Wuerker and Dr. John Asmus of the University of California, San Diego, who suggested the idea of laser-powered dry cleaning. The main objective, though, was to see if holography would be a practical way to foil both Father Time and human vandals by preserving the three-dimensional ghosts of famous sculptures.

Wuerker and Asmus were completely successful. The holograms they made in Venice demonstrated that a whole art gallery of sculpture can be recorded on a carton full of glass plates and recreated by projection anywhere in the world. These three-dimensional images are so lifelike that they even show parallax when the observer moves from one position to another. The experiments proved that major international exhibits of sculpture in holographic form can now be delivered by parcel post, while the originals stay safely in their home museums.

Other proposed uses of holography range from advertising displays and truly three-dimensional movies to new types of security systems. At TRW, holographic memories have been developed which can store a whole library in a space the size of a briefcase. The technique is also being used in rocket and jet engine development to show previously invisible details of gas flow and the behavior of high-speed particles. These studies are expected to result in improved turbine-blade and rocket-nozzle designs. Holographic interferometry has also been used to refine space-craft microwave dish antennas to accuracies far superior to those that are possible with conventional computer methods. Other nondestructive industrial testing techniques are under development and Dr. Asmus continues to improve his methods of restoring art.



Dr. Wuerker aligns a ruby laser and holographic plate to recreate a three-dimensional image of a twelfth-century Madonna and Child, by an unknown Spanish sculptor.



Marble fragment, spot-cleaned by a single, brief pulse of laser energy, reveals its pristine color and texture. The technique is so precise it can be controlled so that only recent encrustations are removed while the natural patina of old stone remains unbarmed. Even stone that has been seriously weakened (to a structural strength equivalent to that of a sugar cube, for example) is not further weakened by laser cleaning.

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