

Saving Da Vinci's Last Supper from Air Pollution

ScienceDaily (Nov. 22, 2011) — Having survived long centuries, political upheaval and even bombings during World War II, Leonardo da Vinci's "Last Supper" masterpiece now faces the risk of damage from air pollution due to its location in one of Western Europe's most polluted cities.



Leonardo da Vinci's "Last Supper." (Credit: Photo/Authorized by the Soprintendenza per i Beni Architettonici e Paesaggistici di Milano, Italy)

In late 2009, the church refectory of Santa Maria delle Grazie, where the painting is located, installed a sophisticated heating, ventilation and air conditioning system to protect the painting from the polluted air of Milan.

To test the effectiveness of their pollution countermeasures, Italian officials called on Constantinos Sioutas, Fred Champion professor of civil and environmental engineering at the USC Viterbi School of Engineering.

For his ongoing research, Sioutas has designed unobtrusive air samplers that are compact and quiet.

"These air pollution sampling technologies are ideally suited for use in sensitive facilities, such as art galleries and museums. They do not disrupt the day-to-day operations of the facility," he said.

A multinational team that included USC scientists used the monitors to determine that indoor pollution has been drastically reduced at the church, though visitors enjoying the painting remain a potential source of soiling. The team's findings will be presented in December in Milan.

The team deployed two sets of air quality monitors for one year at the church and found that -- for the most part -- the Italian authority responsible for the facility housing the famous painting is winning the war with outdoor air pollution.

Fine and coarse particulate matter concentrations were reduced around the painting by 88 and 94 percent, respectively, from their corresponding outdoor levels.

"It's a spectacular reduction," Sioutas said. "It is, frankly, very impressive."

Indoor sources of pollution, however, still may pose a threat of soiling on the painting.

Nancy Daher, USC graduate student and lead author of a journal article on the team's findings, said that fatty lipids from the skin of visitors to the church still appeared in significant quantities around the artwork -- even with visitor access to the painting strictly regulated. The article appears this month in *Environmental Science & Technology*.

Only a handful of patrons are allowed into the church via an airlock-style chamber at any given time and are allowed to stay only for 15 minutes at a stretch.

Airborne lipids from visitors' skin can combine with dust in the air and, if they come in contact with the painting, soil it, Daher said.

"Even the painting itself is emitting," she said.

Tiny particles of wax used in early repair efforts on the "Last Supper" also can get into the air, soiling the painting in the same manner.

In addition to aiding in the conservation of the painting, the team's research can be used as a benchmark for future studies aimed at protecting indoor artworks and antiquities.

Daher's article was co-authored with Sioutas, as well as Ario Ruprecht, Giovanni Invernizzi, Cinzia de Marco of LARS Laboratorio di Ricerca Ambientale SIMG/ISDE in Milan, and Justin Miller-Schulze, Jong Bae Heo, Martin M. Shafer and James J. Schauer of the University of Wisconsin-Madison.

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