

Saving Da Vinci's Last Supper from air pollution

November 22 2011



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

In late 2009, the refectory of Santa Maria Delle Grazie Church, 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," Sioutas said.

A multi-national team that includes 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 (Soprintendenza per i Beni Architettonici e per il Paesaggio di Milano) 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, may still pose a threat of soiling on the [Last Supper](#). 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 painting – even with visitor access to the painting strictly regulated. Her article appears this month in *Environmental Science and Technology*.

Only a handful of patrons are allowed into the church via an airlock-style

chamber at any given time, and are only allowed to stay 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 painting also can get into the air, soiling the [painting](#) in the same manner.

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

Provided by University of Southern California

Citation: Saving Da Vinci's Last Supper from air pollution (2011, November 22) retrieved 27 April 2024 from <https://phys.org/news/2011-11-da-vinci-supper-air-pollution.html>

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