Engineering student uses computer models to help Smithsonian preserve art; figures out why Mona Lisa is cracked

January 3 2005

Engineering and art came together as one discipline for a University of Michigan mechanical engineering student who used computer modeling to help set new guidelines for how the Smithsonian stores art—and believes he has even determined why the Mona Lisa keeps deteriorating despite its controlled environment.
The larger findings from junior Evan Quasney's summer-long research internship at the Smithsonian Center for Materials Research and Education found that two long-time practices in art preservation actually causes more harm that good.

The science-based findings may offend traditional art preservationists, says Marion Mecklenburg, the Smithsonian's senior research scientist, but the numbers don't lie.

Mecklenburg, who led Quasney's research group, believes such computer modeling will change the way art is preserved in the future.

As an interesting outcrop of the research, the 19-year-old Quasney believes he has developed a theory on why Leonardo da Vinci's famed Mona Lisa continues to deteriorate, despite rigid temperature and humidity controls in its chamber.

In the larger body of findings, Quasney's computer model suggests that applying battens —a popular and long-time method of reducing warping

in paintings by fixing sticks of dense wood to the painting's back—actually weakens the panel painting more than if it's allowed to bend naturally, and could cause cracks. Cradling is another method of holding a painting flat, and that causes severe warping.

"His findings really do show us how these paintings respond to temperature and relative humidity, it shows us which conservation methods can be very harmful, and it does help us set the museum environment," Mecklenburg said.

Quasney says that while attaching battens to the reverse of paintings reduces their tendency to warp, the battens may instead cause cracking because they create stress in the panel. The research showed that cradling causes severe warping. Quasney's model showed that applying a layer of gesso (a mixture of hide glue and calcium carbonate) to the reverse of panel paintings not only reduces their tendency to warp with changes in relative humidity but they do not develop significant stresses that cause cracking. This, incidentally, was a recommendation made by painters more than 500 years ago.

Quasney's Mona Lisa theory is an outcome of the larger research findings. Quasney used computer modeling and other inputs to theorize that the Mona Lisa is warping because it hangs on an exterior wall at its home in France's Louvre.

When the temperature falls outside, the wall temperature also drops despite rigid temperature and moisture controls inside the museum.

"The relative humidity in the air was condensing on the wall because the wall was cooler, and dripping into the back of the panel and the wood, which was swelling and splitting," Quasney said. In April, a month before Quasney started his internship at the Smithsonian, the Mona Lisa made headlines after its keepers discovered that the painting had warped

alarmingly since its last examination.

Source: University of Michigan