

# Science unveils master painters' secrets

February 13 2014, by Kerry Sheridan

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Two lions guard the entrance to The Art Institute of Chicago along Michigan Avenue on April 22, 2005

What hue of red was really in that Renoir masterpiece? How did Van Gogh envision his yellow flowers? And did Picasso really use housepaint?

Advanced science techniques are helping shed new light on the original beauty that has faded with time on some of the world's greatest

masterpieces, experts said Thursday.

By scaling down sampling techniques to the most miniature levels, scientists can now figure out how individual molecules in a painting vibrate differently, allowing them to see the true organic colors as they were over a century ago.

"We analyzed what the molecules as they were under the frame to tell us what they should be now," said Richard Van Duyne, professor of chemistry at Northwestern University, describing a powerful X-ray and microscope technique known as surface-enhanced Raman scattering that was used on a Renoir painting from 1883, called Madame Leon Clapisson.

The painting and its reconstruction are now part of an exhibit that opened February 8 at the Art Institute of Chicago, showing how scientists would revive the rosy and rusty hues to restore how it might have looked back then.

Dutch scientist Joris Dik described how cadmium yellow turned grayish in Van Gogh's painting, *Flowers in a Blue Vase*, from 1889.

"We are very much interested in replicating the original painting," he told reporters at the American Association for the Advancement of Science annual meeting in Chicago.

A digital reconstruction of the flowers Van Gogh painted shows a deeper, brighter clutch of yellow flowers.

Dik's lab at the Delft University of Technology in The Netherlands is now working on recreating surface texture and original color in a three-dimensional image in order to showcase what the artist did without changing his actual work.

"With these digital reconstructions we are not bound by the ethical or technical limitations" that standard approaches to conservation have, he said.

## **New view of old masters**

Someday, art enthusiasts may have a completely new view—and feel—of the works by great artists. Already, visitors to the Van Gogh museum in Amsterdam can purchase and take home their own 3-D printed Van Gogh replicas.

Many of the scientific techniques aimed at deconstructing paintings are anything but new—having actually begun in the late 1880s—but have been continually refined over time, experts said.

The miniaturization of analytical equipment and the portable nature of many instruments has boomed over the past decade, meaning more work can be now done inside the museums, and do not require costly or dangerous transportation of artwork.

"We haven't seen the peak of that yet, so we are living in very interesting times," said Dik.

Nanotechnology to study art and cultural heritage also has applications that extend into other realms of life, from the making of miniature batteries to delivering cancer treatments to patients with advanced disease.

"At the end of the day, we are dealing with the same problem. We have meter-scale objects that we need to be able to study down to the individual molecule," said Van Duyne.

Last year, scientists used high energy X-rays to reveal that Picasso was

using housepaint in some of his artwork.

"It was only possible to do this because we had this very high spatial resolution so we can see extremely small things," said physicist Volker Rose of the Argonne National Laboratory.

"It also had the sensitivity to pick up the smallest traces of impurities."

While the revelation has stirred plenty of controversy, Rose said the take-away message should be an inspiring one.

"We now know that if you go and buy a can of conventional housepaint, any one of us can be a Picasso."

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