

THE SCIENCE OF ART RESTORATION

by Anna Song

Old masterpieces are appreciated even today for their timeless beauty. However, substances in the air, harsh lighting, and the nature of the art mediums used will often degrade these artworks over time (Bagwell,² 2005). They can only be viewed in the present because of the careful restoration that art conservators perform. Art restoration requires not only knowledge of artistic techniques and materials, but also scientific techniques. Science plays a key role in the preservation of classic art pieces that many people enjoy today.

In the past, bizarre methods were used to attempt to preserve art pieces. The Sistine Chapel was once restored by using wine and bread, and some paintings were restored using ash from burnt wood (Brazil,³ 2014). These techniques often did more damage than good for the art pieces – when people used wood, ash and water to restore paintings, a very basic solution would form that would harm the painting (Chalkley,⁴ 2010). These techniques were replaced with modern, more scientific techniques that allow art conservators to restore paintings to close to its original condition.

Art conservators will often first X-ray the painting they are trying to restore to find out what kind of materials the original artist used, and the amount of damage that was done on the original paint (IMA,⁷ 2007). Since different paints have different absorptions – for example, black paint absorbs a lot of radiation – the conservator can gain a lot of valuable information about the composition of the painting from X-rays (IMA,⁷ 2007). Also, since some piece are much too big or fragile, the Mobile Micro-X-ray Fluorescent Analysis technique was developed from devices originally used in the field of geology (Herm,⁶ 2008). In addition, ultraviolet light can be used to see which parts of the painting were painted by the original artist, and which parts were added later by other conservators (IMA,⁷ 2007).

After getting extensive knowledge of the painting and its history, art conservators will remove old varnish, dirt, and other unwanted materials that cover the painting (Bagwell,² 2005). This is done by

first finding out the composition of the varnish using Raman spectroscopy (Chalkley,⁴ 2010). Waves that are directed towards the painting are partly absorbed and then reflected, resulting in a wave with a different wavelength (Chalkley,⁴ 2010). Since different varnish materials absorb different amounts of light, measuring the reflected wavelength allows the conservator to determine what material makes up the varnish, and create a solvent to remove that varnish (Chalkley,⁴ 2010). Raman spectroscopy is attractive because it does not damage the sample, and needs a very small sample or none at all (Chen et. al,⁵ 2007)

However, the solvent may affect the art itself, rather than just the varnish, so engineers have come up with a new technique to remove varnish and dirt – lasers (Bagwell,² 2005). Lasers of low wavelength are used to “zap” the dirt and varnish off of an artwork (Bagwell,² 2005). Low wavelength lasers have less energy, so they will remove dirt and varnish, but not affect the artwork (Bagwell,² 2005). In addition, Laser Induced Breakdown Spectroscopy has been developed; this detects when the laser has “zapped off” all the varnish and reaches the paint, since varnish and paint emit different amounts of energy when affected with a laser (Bagwell,² 2005). Before this development, it had to be guessed by the engineer when the laser has removed all the varnish and reached the paint, which was an unreliable method (Bagwell,² 2005).

Not only has lasers and X-rays been used to restore art, but even bacteria have been used to remove unwanted contaminants on the artwork (Asociación RUVID,¹ 2011). In Spain, a team of microbiologists, biologists, and restoration scientists used bacteria to restore the Church of Santos Juanes (Asociación RUVID,¹ 2011). Conservators around the world have to continuously come up with creative methods to restore each unique piece.

These methods allow art conservators to find out information about the painting and to prepare it for structural restoration. Without the development of scientific methods, many of the art pieces we have today would not be so well preserved, or damaged by the harmful conservation methods that were

practiced in the past. Science is crucial in maintaining the art pieces that have been created in the past, and therefore in maintaining culture around the world.

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