Conference Review

Metal Soaps in Art, 2016

by Charlotte Ameringer

Author's note: The conference provided a good mix of talks by conservators and conservation scientists containing relevant information for both. I hope to provide an overview of the conference and to summarize the information presented from a practicing conservator's perspective. Conservation scientists have added immensely to our understanding of the phenomenon of metal soaps, and there was much discussion regarding the need for continued sources of funding for this important and critical research.

It is with upmost respect for their efforts that I will only lightly touch on presentations dealing with the details of scientific analysis, those dealing with advanced and/or innovative analytical techniques, and those that discussed specific and detailed models for the processes involved. Not being a conservation scientist I do not feel qualified to discuss these with the expertise they are due.

Over March 14th and 15th 2016 the Rijksmuseum hosted a conference and workshop on metal soaps in art. The conference brought together a veritable who's who of conservation scientists, conservators, and art historians to discuss the present state of knowledge with regard to all aspects of metal soap degradation phenomena. The conference was extremely well-organized and information dense.

Each day was divided into 3 sessions consisting of a longer talk by an invited speaker followed by five "poster pitch sessions" during which presenters had 5 minutes to highlight their posters. The invited speakers were Dr. Gillian Osmond, Dr. Joen Hermans, Dr. Costanza Miliani, Dr. Aviva Burnstock, Dr. Silvia Centeno, and Dr. Jaap Boon. The posters presented a wide variety of subjects including case studies, specific scientific advances in technique and approach, and various models of the processes at play. Attendees could view/read the posters and talk with the presenters during breaks.

Each day ended with participants attending one of several options for workshop sessions followed by a regrouping of all attendees to discuss the "findings" of the individual workshops. The proceedings of the conference will be published in a forthcoming book, "Metal Soaps in Art: Conservation and Research," by Springer due out Summer of 2017.

History of Metal Soaps

Day 1 started with Petria Noble presenting a historical overview of metal soaps. Most conservators will have heard of metal soaps, or perhaps lead soaps, by now. The phenomenon was extensively studied by MOLART, AMOLF, and others following the 'discovery' of a large number of protruding masses and small "holes" in the paint film of Rembrandt's *The Anatomy Lesson of Dr. Nicolaes Tulp* when it was examined at the Mauritshuis in 1996.

These masses were subsequently found to consist of lead carboxylate soaps, and thus began the metal soaps journey. A 2002 survey revealed these metal soap aggregates to be present in thousands of paintings ranging in date from the fifteenth to the twentieth century – some estimates say that this phenomenon affects 70% of paintings in museum collections.

In some paintings the appearance of the metal soaps had been mistakenly attributed to the artist's use of sand in the paint media and/or abrasion of the paint film. Ms. Noble discussed the different stages of lead soap aggregate formation beginning with (1) intact paint and progressing to (2) an early stage with small aggregates and increased transparency, (3) expansion of mature aggregates leading to their eruption through the paint surface, (4) a more advanced stage with protruding aggregates and remineralization, and finally (5) late stage mature aggregates that are partially dissolved or lost.

One consistent feature of many paintings exhibiting metal soaps was exposure to high levels of relative humidity. Ms. Noble showed many beautiful images of metal soaps both in cross section and as surface phenomena. She noted that we now know that metal soap degradation products can take many forms and manifest in differing ways.

What is a Metal Soap?

Metal soaps are salts, also called carboxylates, of a metal and long chain fatty acids or diacids. In the multi-layered structure of an oil painting metals are most commonly found in the pigments used in paint and ground layers (e.g. lead and zinc white) or in paint additives (e.g. lead acetate or zinc sulphate), while fatty acids are typically present in paint binders (e.g. linseed oil) or, in some cases, in varnish layers (e.g. oil/resin varnishes).

Soaps form when positively charged metal ions (cations) react with negatively charged free fatty acids or diacids (anions) to form an electrically neutral compound - a salt. Some think that the formation of these soaps is part of normal reactions that take place during the cross-linking of oil binding mediums. It is when these soaps begin to aggregate or migrate within the paint matrix that undesirable changes arise resulting in the observed metal soap degradation phenomena.

The chemistry of metal soap formation is not yet fully understood but as a field we are making great strides in our understanding. The mechanisms involved, e.g. which factors trigger the processes and how they might be prevented or decelerated, are not yet fully known. There is reasonable evidence to suggest that the phenomenon may result from specific qualities inherent in the artist's materials and techniques, from conservation procedures, and/or from the object's exposure to certain environmental conditions such as high temperature and relative humidity. However, this has yet to be empirically proven.

Metal soaps can form aggregates that result in numerous small lumps/bumps/"pimples" on the surface of a painting. When these aggregates are decapitated or lost they appear as tiny white spots (often mistaken as abrasion) or leave small craters (voids). These craters can subsequently become filled with dirt and/or varnish taking on a dark appearance resulting in tiny dark spots, which can look similar to mold.

Metal soaps can migrate to the surface of an artwork producing efflorescence resulting in a hazy or patchy appearance.

Metal soaps can result in increased transparency of the paint films as the metal ions migrate out of their original layer(s) to form soaps. We now know that the phenomenon of "ground staining" (often seen in 19th-century paintings, esp. in the Hudson River School) is a result of increased transparency of paint and ground films due to the formation of metal soaps.

Metal soaps can also react with environmental pollutants or other ions that may be present in the paint films, such as sulphur or calcium, and form crusts on the paint surface (e.g. oxylate crusts). These crusts are often very intimately bound to the paint layers and are very difficult to remove.

While lead and zinc soaps are currently the most well known metal soaps, soaps can also form from other metal ions - such as calcium, copper, and iron; these metal soaps remain less well studied than those formed by lead and zinc.

Zinc Soaps

Invited speaker Dr. Gillian Osmond discussed her ongoing research into zinc and zinc soaps. Dr. Osmond first gave a brief history of zinc white's (zinc oxide) use as an artist's material. It was initially introduced as a less toxic alternative to lead white and is more resistant to yellowing and darkening. These properties caused it to be incorporated in many white and colored commercial paints, sometimes as an undeclared additive, beginning in the mid 19th century and for much of the 20th century until titanium white began to dominate the industry. As an example, Ripolin paints are zinc-based.

Unfortunately zinc is very reactive in oil-based media and created challenges within the commercial paint industry for managing shelf-life and durability. Many of these commercial studies have proven useful in our understanding of zinc soaps.

The majority of zinc oxide is produced in one of two pyrolytic processes – a direct ("American") process and the indirect ("French") process. As Dr. Osmond illustrated these processes are important as pigment size, shape, and the manufacturing process all affect zinc's reactivity, with indirect or French process zinc oxide generally being less stable.

Dr. Osmond showed numerous examples of zinc carboxylates that have been identified in various paintings/paint films. FTIR (Fourier transform infrared microspectroscopy) being a key tool used to identify metal carboxylates. Of note - the presence of aluminium stearate (a component present in some paint formulations) in combination with zinc is highly detrimental. Although there is not (yet) a proven causality, it is highly likely that environmental factors do play a role in zinc soap formation.

Zinc soaps have been implicated in the deterioration of increasing numbers of paintings, in particular widespread structural instabilities seen in a group of mid 20th-century abstract expressionist paintings with zinc oxide-based preparatory layers. Zinc soaps can manifest as disfiguring lumps -as seen in works by Vincent van Gogh, widespread paint cleavage – as seen in the works of mid-century abstract expressionists, or as a disfiguring surface bloom that proves resistant to cleaning or saturation. It is thought that zinc soaps lead to embrittlement of the paint layer.

Dynamics of Metal Soap Formation

Invited speaker Dr. Joen Herman's talk looked at metal soap formation from a molecular viewpoint to gain a better understanding of how and why metal soaps form. I will only give a brief synopsis of his talk as it involved many images and phase diagrams, and my notes do not allow me to discuss the finer points of the analysis undertaken.

Dr. Herman presented the progress to date in the development of a model for metal soap formation and crystallization. A simplistic model of how oil paint films "dry" holds that they dry through oxidation resulting in a polymer network. It turns out that this process is less straightforward and more complex, and that oil paintings are not stable objects from a chemical point of view. Improved analytical techniques such as attenuated total reflection Fourier transform infrared spectroscopy (ATR-FTIR) and differential scanning calorimetry (DSC) were used to study the transition from amorphous material to crystalline fatty acid or metal soap.

Some important concepts raised were: the finding that metal ions "hop" or diffuse through the polymer network and can migrate quite far away from their original location. Hydrolyzation of the ester bonds is critical to the creation of the free fatty acids needed to form metal soaps, and it is thought that the availability of free fatty acids drives the process of metal soap formation. If a high concentration of free fatty acids and metal ions is present, the kinetics of the system will be thermodynamically pushed towards the creation of metal soaps.

Interestingly, the rate of metal soap and fatty acid crystallization decreased rapidly with the degree of linseed oil polymerization, possibly leading to systems where metal soaps are kinetically trapped in a semi-crystalline state. Various morphologies of metal soap aggregates were observed in oil paint layers, and it is suggested that factors

like exposure to heat, moisture, and/or cleaning solvents as well as the presence of microcracks play a crucial role in the rate of crystal growth and the probability of crystal nucleation although Dr. Herman reminded the audience that correlation does not equal causation.

Structure and Distribution of Zinc Carboxylates at a Macro and Micro Scale

Invited speaker Constanza Miliani discussed the use of non-invasive reflection FTIR spectroscopy and ATR-FTIR to investigate different forms of zinc carboxylates found in simple model paintings and actual modern and contemporary oil paintings. This talk dealt primarily with methods of analysis that can be used to identify the various forms of zinc carboxylates present in test and actual paintings.

Of note: it was found that carboxylates formed quickly in test paintings, in as little as 60-120 days. The effects of various additives in commercial paints can accelerate the formation of zinc soaps, e.g. aluminum and chromium. Zinc oxide was found to be more stable than zinc sulphate or zinc carbonate.

Metal Soaps in Paintings – Phenomenologies and Challenges for Conservation

The fourth invited speaker, Dr. Aviva Burnstock, discussed the phenomenon of metal soap degradation and the challenges that it presents for the conservation of works of art. She began by presenting numerous examples of the various expressions of metal soap formation and degradation on paintings from a variety of periods and on a variety of supports. Her examples included enlarged and magnified images taken of painting surfaces as well as images of cross-sections and analytical results.

Metal soaps have been identified on paintings on all types of supports. They can take the form of dark "oil spots" as seen on a painting by Goya. In this example the painting had an applied oil/resin varnish which reacted with metal ions from the paint/ground layers resulting in dark spots on the surface. Looking at a cross-sections revealed metal soap aggregates surrounded by a pool of free fatty acids causing the dark "oil spots" seen. In this case it was thought that the oil containing varnish served as a reservoir of free fatty acids. Recrystallized lead was also seen at the center of the lead soap aggregates; this is a later stage in metal soap formation.

In examples of paintings with paint instability, particularly ground/paint and interlayer paint cleavage, Dr. Burnstock showed cross-sections analyzed using backscatter electron micrography, which revealed horizontal microfissures at the boundary between paint layers. These microfissures result from metal soap degradation and are thought to be responsible for the paint instability.

Another example discussed was a dark lead soap crust that had formed on the surface of a painting but only in areas without paint along the edges of the work. A second example of a zinc-based crust was shown. In this case it was thought that the presence of chlorine and sulphur – most likely from the environment or possibly from paint additives - played a role in the formation of the crust. The mechanisms for the role these compounds (Zn, Cl, S) play are not fully understood although it is suspected that they accelerate the degradation processes.

Dr. Burnstock pointed out that the types of research that give us information about what phenomenon we are looking at and help us gain understanding of the processes and mechanisms involved are different from the types of experiments that would best inform conservation practice.

In the case of metal soap crusts, which are often insoluble in the range of solvents safely employed by a conservator, there seem to be three primary approaches to treatment – saturating the affected areas through local application of varnish, locally retouching the affected areas, and attempts to reduce or remove the crust.

The most promising results in reduction or removal of the crust employed chelators (in particular EDTA, which has a preference for lead) at varying pHs, in some cases thickened or gelled to control application. By manipulating pH, concentration, and delivery method it was possible in some cases to reduce or even remove these intractable crusts. In some cases the gels softened the crusts enough that mechanical removal was possible. What remains unknown is whether these crusts will return as the aging and degradation processes inherent in the paint film continue.

Understanding the Dynamics of Lead Soaps in Oil Paintings

The fifth invited speaker, Dr. Silvia Centeno, discussed the dynamics of lead soaps. This was another more science-oriented talk looking at phenomena on a molecular level. I will give a brief overview of the talk.

Various analytical techniques were employed to gain an understanding of the mechanisms and factors that trigger metal soap formation and the dynamics of the reactive compounds present in paint films. The goals of the ongoing research are to identify which species are mobile within the paint film, how changes in temperature and relative humidity affect the dynamics, and how mobile various species are.

To do this the experiments looked at metal soap formation in paint films in differing relative humidity conditions, and the dynamics and mobility of palmitic acid and lead palmitate in a linseed oil matrix at differing temperatures. The research found that with increasing temperature the static fractions decrease. It also found that as RH increases, the reaction rate of metal soap formation increases. It is unclear whether this is due to swelling of the paint film which opens channels for reaction or whether increased RH accelerates hydration of the free fatty acids. The behavior

of short-chain soaps differs from that of long-chain soaps. Again it is important to note that correlation does not equal causation. This research is ongoing.

Polar Medium Exudates in Oil Paintings and Their Disastrous Consequences

The last invited speaker, Dr. Jaap Boon, discussed one of his most recent research directions - exudates in oil paintings.

Dr Boon began by reminding us that the aging of oil films is a dynamic process and involves "slow chemistry." He showed numerous examples of oil paintings with various exudates – some liquid, some more solid. Some examples of forms these exudates can take include drips, sticky surfaces, and small metal soap "balls" visible on the surface. Degradation phenomena seen include dried paints that re-liquefy over time, as seen in paintings by Karel Appel; delaminating paint layers as seen in works by Hans Hoffman; and fluid drips as seen in the works of Frank van Hemert. In the case of drips, the paint films were initially "dry," and over time components within the film reliquefied, in the case of van Hemert about 7 years later.

These exudates are fluorescent and can be easily seen in UV. The liquefaction results from polar medium fractions within the paint film that cannot be accommodated by the paint mass, e.g. they are unable to anchor within the paint matrix and then migrate to the surface. The reasons for this lack of "anchoring" are thought to be related to paint formulation, metal soap additives, a lack of coordinating metals in the paint film, and surface treatments of the fillers and pigments used in the paints. In Dr. Boon's words, "the paint doesn't know it's on canvas any longer."

Of note is Dr Boon's observation that there are almost no [tubed/commercially produced] paints any longer that are 100% linseed oil; most contain other oils – sunflower and safflower (both of which are semi-drying oils) were mentioned – as well as numerous additives. There does seem to some difference between student-grade and professional-grade paints, with professional grade paints having fewer fillers added. Also of note was the observation that high relative humidity increases this degradation process driving out the polar material faster.

Workshop Discussions

Both days of the conference concluded with a moderated discussion of the various break-out workshops participants could elect to attend. On both days the discussions had similar themes so I will summarize some of the salient points raised during both discussions together.

While research into the phenomenon of metal soaps has progressed in leaps and bounds creating an increasingly solid foundation, there remain many unanswered questions for practicing conservators: Are there trigger events that lead to the formation of metal soap aggregates and degradations processes? What are the triggers? Once triggered do these processes run to an inevitable conclusion (thermodynamics) or can they be slowed or halted? Are there warning signs? Do certain treatments exacerbate the formation of metal soaps? How do solvents affect these processes? What causes the various expressions of metal soap degradation (e.g. aggregates vs. increased transparency vs. carbonate layers)? Removal of degradation products seems to be a temporary fix, at least in some cases – example of a Rembrandt with the repeated ned to remove a hazy surface layer. What influence do these degradation processes have on the mechanical properties of paintings?

The good news is that there is quite a bit we do know. At least some of these phenomena, although perhaps new to conservation, are not new to other fields and pertinent literature does exist. If we look at historic writings, we see that artists in the 18th century were already aware of and discussing some of these phenomena, e.g. the increased transparency observed in paintings. Literature regarding commercial paint manufacture from the 1930s/40s discusses the problem of zinc soap formation.

Different layers within a painting seem to play a role with some layers serving as reservoirs of reactive material (e.g. medium-rich layers adjacent to layers containing metal-based paints). Paint/ground particle size and shape seem to play a role. Heat seems to play a role (e.g. from lining procedures or local treatments) in triggering the formation of metal soaps - lead soaps melt at 120 degrees Celsius. Some metal soaps appear to go through phase changes and these phase changes are "game changers." But, are we accelerating processes that would happen anyway or are we activating new pathways?

As a field we need to create a database of physical histories for artworks. Using various analytical techniques it may be possible to monitor the occurrence of metal soaps. There are also simpler means of monitoring that may be effective (e.g. x-radiography as lead soap aggregates may be visible in x-rays) or UV photo documentation (many of the degradation products are fluorescent).

While no causal relationship has been confirmed through analysis, we do have a pretty good body of evidence suggesting that temperature and relative humidity do have an effect on the kinetics of metal soap degradation processes. There is also evidence for a relationship between metal soap formation and materials and techniques. Layers containing lead or zinc (e.g. ground or paint layers) adjacent to layers with a high density of media seems to be conducive to the formation of lead soaps with the media-rich layer providing a source of fatty acids that the metal ions then react with.

Some adjacencies appear to be particularly problematic: zinc-containing layers over lead-containing layers; zinc and/or lead-containing layers which lie under black pigment-containing layers; binding media-rich layers (e.g.

red lakes, earth pigments, etc.) adjacent to zinc and/or lead-containing layers. The presence or absence of a varnish may affect these processes. Modern paints contain many additives that likely affect these processes negatively.

There was some discussion of wax linings and whether the presence of wax may retard some of these effects based on the example of paintings by Mondrian where those that were wax lined showed less, possibly no, obvious metal soap degradation. Possible explanations for this observation are that perhaps the soaps do form but remain more anchored so are less likely to form aggregates; or that the crystalline structure of the wax may prevent the formation of metal soaps by disallowing migration of free fatty acids and/or metal ions.

It was suggested repeatedly that the formation of a visual database and networks for sharing information and observations is an important (crucial?) step in furthering our understanding of metal soaps. [I have to note that one of the most enlightening aspects of the conference was seeing so many visual examples of metal soap degradation phenomena.]

A few final observations were made. Based on our understanding of the aging of oil paintings metal soaps themselves are not necessarily a bad thing. And as Ken Sutherland aptly pointed out, it is important as we are made more aware of metal soaps and our understanding of metal soap phenomena increases to not overdiagnose its presence.

Poster Highlights

- Works by Franz Kline that exhibit fragile paint layers, flaking, interlayer cleavage, and active paint loss in conjunction with the presence of zinc and lead soaps. It is not currently understood why not all Kline paintings exhibit these conditions. Exacerbating external factors including poor RH control and liberal travel are thought to have contributed.

- Observation of 17th and 19thcentury paintings on panel where the metal soap formation follows the wood grain resulting in increased transparency visible as dark lines. Also noted were areas where the paint and upper ground are pushed up in long ridges eventually resulting in paint loss due the increased volume of the metal soap aggregates.

- A work by Mondrian where zinc soaps have resulted in localized areas of wrinkling, blistering, and delamination in passages of cadmium yellow paint found to contain zinc white, likely as an additive.

- A work by Mondrian exhibiting severe cracking and flaking resulting in numerous losses. The presence of zinc oxide was identified in lower paint layers and the presence of two types of zinc carboxylates was confirmed: amorphous zinc carboxylates, considered to be from an initial stage of degradation, and crystalline zinc carboxylates, a further step in the degradation. The crystalline zinc carboxylates were seen at the delamination interface.

- Investigation into works by Appel and Hoffman showed an unexpected pattern of zinc soap formation – lamellar soap formations and fatty acid chain packing.

- Mock ups created to model the lead soap degradation process in oil paintings were created by creating an intermediate layer (a so-called "reactive layer") between a ground and a black paint layer. The study found that variations of various metal soap components found in the "reactive layer" affects how and where metal soap aggregates are formed. This suggests that paint layer composition does influence the kinetics of lead soap formation.

- Aging of natural resins in the presence of common historical pigments. In these studies it was the terpene acids that react with the cations in the pigments. It was found that generally the presence of a pigment reduced the stability of the resins and that some pigments, notably Zn and Cu, have a "catalytic" effect. These processes can affect the removability of varnishes. The study proposed the idea that smalt discoloration may constitute a carboxylation process.

- A study looking at two different zinc particle sizes in reaction with a variety of oils led to the observation that not all zinc soaps form aggregates. Factors that affect reactivity include particle size - with smaller particles increasing reactivity. Exposure to increased relative humidity (e.g. that experienced during a lining process) and elevated temperature also increase reactivity.

- An intriguing alternate theory for formation of metal soap aggregates based on colloid chemistry based on examination of a Max Beckmann triptych.

- A look at a series of painted wall hangings that have been in the same location for over 200 years seems to indicate that environmental factors do play a role. The highest degree of lead white degradation/soap formation was found in samples taken from the painting closest to the windows.

- An investigation into the migration of metal ions from the paint/ground layers into oil-resin varnish layers resulting in varnish layers which are more difficult to remove with conventional methods.

- The alteration of copper pigments due to the formation of copper metal soaps. This resulted in chromatic changes, e.g. browning or darkening.

- A comparison of two Salvador Dali paintings that exhibit unique zinc-oxide degradation. Both had been glazed and were unvarnished. Extreme degradation of the zinc white containing paint in one of the works is

hypothesized to have been triggered by exposure to high temperature and humidity during a one-day photo shoot in 1936. Only one of the panels was photographed. The one not photographed showed much less extreme degradation.

- A look at the varnish residues present in craters caused by loss of lead soap aggregates. Because the varnish was found in the crater it is suspected that the varnish was applied after formation and loss of the lead soap aggregate and thus likely not artist applied.

- Use of aqueous gels for the removal of inorganic salt crusts (a form of metal soap degradation). A visually disturbing grey haze was found following devarnishing. This layer was found to be insoluble in organic solvents. Testing of Pemulen TR2 and methyl cellulose gels with chelators was found to be effective at solubilizing the salt crust.

- An oxylate crust that was best removed mechanically.

- Small white spots on a 17th-century painting initially thought to be due to abrasion from past cleaning were analyzed and found to be caused by lead soap aggregates that had been decapitated. This finding influenced a more conservative approach for the treatment.

- A look at calcium and lead soaps present on two paintings in architectural settings. It is thought that some of the components which lead to the formation of the calcium soaps originated in the lead-based adhesive and the plaster wall. The formation of the metal soaps resulted in areas of cleavage and paint delamination.

- A look at the how metal soap formation may affect the ratio of relative amounts of palmitic and stearic acids present in a medium and how this may affect identification of drying oils. The P/S ratio is often used to identify the oil source in paint binders.

- Georgia O'Keeffe paintings show micro-protrusions. O'Keeffe noted the presence of small pinpoint losses in paintings during her lifetime suggesting that the soap formation process began very early in the paintings' history. Multiple angles of UV light with a fixed camera were used to create a 3-d morphology of the surface that will allow monitoring of changes to the surface.

- metal soaps identified in paintings by James Ensor resulting in protrusions and dry and brittle paint layers.

- use of non-invasive reflection mid-FTIR spectroscopy to identify metal oxylates in-situ.

- metal soaps identified in paintings by Pierre Soulages resulting in delamination of paint layers, lifting paint layers, softened under layers, and liquid drips and exudations.

- metal soaps added to modern oil paint on purpose as dispersion agents, stabilizers, and extenders.

Articles You May

"Louvre to Restore da Vinci's 'St. John the Baptist'," *The Wall Street Journal*, 01/13/2016

The Louvre will begin restoring Leonardo da Vinci's "St. John the Baptist" (1508-19) in the coming weeks, leaving just two of the museum's five masterpieces by the Renaissance giant untouched by restorers, including its most famous occupant: the "Mona Lisa."

The museum says layers of varnish applied on the portrait of an intriguingly young and androgynous St. John the Baptist over the past five centuries to protect it have grown opaque, masking important parts of the painting, including the cross he bears and the pelt he wears. "The details are in the shadow now, while 10 or 20 years ago they were more visible," says Vincent Delieuvin, chief conservationist for Italian renaissance art at the Louvre.

The attempt to enliven one of the most representative examples of da Vinci's techniques is making some art experts nervous, however, after the firestorm that followed the French museum's restoration of another of the artist's works in 2012.

In addition to showing off the artist's technique, the painting holds historical significance. It was one of the few the master kept with him as he moved to different cities in Italy and, in his later years, to the court of French King Francis I. Mr. Delieuvin says many documents, from drawings and sketches to other paintings, show that da Vinci worked on "St. John" for years. The Louvre hired well-known master restorer Regina Moreira to handle the restoration process.

"Big Meaning in the Minuscule: Art Museum Explores Conservation," *Cincinatti.com*, 01/28/2016

After the before and before the after. That's where Serena Urry lives. As chief conservator for the Cincinnati Art Museum, Urry is the line between phases in a painting's life. A map to take filthy to fine. Crumbling to composed.

Urry's work is key to the preservation, the presentation of the museum's nearly 66,000 artworks, some dating to the time when we rocked the Cradle of Civilization. Her workshop, however, is hidden, kept behind the curtain. Yes, an actual curtain. The steely gray one you don't really notice as you stroll into the Great Hall from the lobby.

But not anymore. Starting Tuesday, you can't miss her: She's the star of the exhibit, "Conservation on View: Zaragoza's Retablo of St. Peter." For the first time in her 25-year career, Urry cleans paintings in front of the curtain, restoring the golden glimmer to the 18 painted panels of a 600-year-old Spanish altarpiece. Standing 10 feet tall and nine feet wide, the work also represents one of the largest conservation projects in the museum's history.

"Frost Art Museum Will Display Giant Roman Jigsaw Puzzle," *The Examiner*, 01/29/2016

The Lod Mosaic, a 1,700-year-old Roman mosaic from the Eastern Roman Empire in what is now Israel, will go on display in the Patricia & Phillip Frost Art Museum at Florida International University on February 10, 2016.

Discovered in 1996 by construction workers who were digging to widen a road, the third-century CE mosaic was rescued by the Israel Antiquities Authority (IAA). Entitled "Predators and Prey," it is notable for its subject matter, its size, and its outstanding degree of preservation.

The mosaic covers an area of about 6,996.5 square feet and was divided into 30 "fragments" for relative ease of handling and study. Seven of these fragments, totaling 344.4 square feet, have traveled the world during the past three years.