Workshop Review

The Modular Cleaning Program: First Impressions from a Four-day Course and Subsequent Implementation

INTRODUCTION

On September 20-23 2016, the authors participated in The Modular Cleaning Program, a four-day course, presented by private conservators Chris Stavroudis and Nina Roth-Wells, held at the Lunder Conservation Center, Smithsonian American Art Museum, Washington D.C. The course introduced fourteen conservators from different disciplines to the Modular Cleaning Program (MCP) through lectures and practical sessions. All participants left with full sets of freshly made aqueous cleaning solutions to trial further in their own practice.

While the MCP already has a certain following amongst our American colleagues – this course had double the number of applicants to the number of available places – it is not our impression that many British conservators have yet adopted the MCP into their daily practice. This article therefore offers a brief introduction to, and first impressions of, the MCP, and presents two case studies trying out the software and cleaning systems after the course. It also discusses how the authors feel the MCP might supplement our usual conservation practice.[1]

WHAT EXACTLY IS THE MCP?

The Modular Cleaning Program offers a systematic methodology for the cleaning of painted surfaces, using a range of pre-made, aqueous test solutions, supplemented by database software developed in FileMaker Pro that facilitates the testing process. Moreover, the stock solutions are designed to last for months, even years, so time is not spent mixing test solutions from scratch each time. The methodology is particularly suited to address the issue of surface dirt and grime on modern and contemporary paintings.

Development started in the early 2000s, when Chris Stavroudis, a painting conservator in private practice in California, developed the MCP as a way of systematising the cleaning techniques developed by Richard Wolbers. With input and contributions from Richard Wolbers and Tiarna Doherty, then a Getty painting conservation intern, the first version of the Modular Cleaning Program (MCP) was introduced at the 2003 Verband der Restauratoren symposium ‘Surface Cleaning – Materials and Methods’. Shortly thereafter solvents and solvent gels were added to the MCP.

The latest available version was released in 2009; however, a new version of the software, incorporating emulsions, is due to be released imminently. The MCP software is available to the wider conservation community for free and can be downloaded from the CoOL website.

The Modular Cleaning Program is constantly being augmented to reflect the ongoing research into aqueous cleaning of modern paint films undertaken by Richard Wolbers. The Cleaning of Acrylic Painted Surfaces (CAPS) initiative, sponsored by the Getty Conservation Institute, held its first meeting in 2009, and has since run six workshops in the US, UK, Canada and Australia.

The MCP facilitates the testing of aqueous cleaning systems of increasing potency, in which an aqueous cleaning test can include up to five different components that influence or contribute to the cleaning action. The MCP operates within a pH range of 5.0 to 6.5 for acrylics and 5.5 to 8.5 for traditional paint surfaces, and the solutions are furthermore adjusted to appropriate conductivities. It is thus designed to ensure that minimal swelling of the paint film occurs, while the aqueous system interacts with the unwanted material present on the paint surface.

The full range allows for a logical and surprisingly quick identification of optimal aqueous systems to remove light to heavy soiling of varied composition, which has become bonded to the surface of a painting to a greater or lesser extent. However, the more potent solutions can also be employed to attack aged varnishes, and the gradual adjustments will, in Stavroudis’ own experience, frequently make the ‘unpacking’ of layers possible.

THE FIVE ORTHOGONAL COMPONENTS OF THE MCP AQUEOUS SYSTEM

A MCP test solution will consist of a 5ml aqueous mixture with up to five different components. In principle, one or more of the five parts can be deionised water, depending on the complexity of the mixture. Crucially, each of the components (except the water) must never exceed one part in five; deionised water is used to make up a deficit, should fewer than five components be used. Thus, the concentration of each component is sufficiently diluted from the stock concentrates to be used on a paint surface. Each type of component of the aqueous cleaning set is introduced here.

pH- and conductivity-adjusted water

While the adjusted waters are not one of the five components, they are nevertheless essential. Ammonium hydroxide and acetic acid are employed to make pH-adjusted water, ranging from pH 5.0 to 8.5. Critically, the water as well as the very dilute ammonium hydroxide and acetic acid all evaporate leaving no residue. The adjusted

The *Newsletter* has done a pretty thorough job of covering the development of the Modular Cleaning Program over the years. However, unless I missed one, the last articles on the MCP were: The CAPS 3 London Workshop: A Space-time Continuum of pH and Conductivity by Nicholas Dorman, and More from CAPS3: Surfactants, Silicone-based Solvents, and Microemulsions by Chris Stavroudis, 34/3, Sept. 2012.

This article, which appeared in *The Picture Restorer* (the journal of the British Association of Paintings Conservator-Restorers) No. 50, Spring 2017, contains the basic principles and some new developments, as seen and described by fresh eyes.

The Editor

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by Christine Slottved Kimbriel and Jenny Rose

waters are vital as the all-important clearance solutions.

Although the NH_3OH and CH_3COOH mixtures have the ability to buffer in the acidic range (pH 3.8-5.6) and the basic range (pH 8.3-10.1), they do not buffer between the two, i.e. between pH 5.6-8.3. But if used for cleaning in its own right, pH-adjusted water will start buffering if the ionic material picked up during a cleaning procedure changes the pH drastically, thereby inhibiting a radical change of pH in the cleaning solution.

The recipes for making adjusted water provided during the course also aimed to achieve the desired conductivity (either 1000µS/cm^3 or 6000µS/cm^3), and if a conductivity meter is available, it can be adjusted very precisely. Stavroudis is, however, more concerned about an incorrect pH than conductivity, and feels that while a pH meter is indispensable, a conductivity meter is not essential.

pH buffers

MCP buffer solutions are the first components added when making up a 5ml test solution. The buffers ensure that although the material lifted into the wet swab from the paint surface adds new ions to the aqueous cleaning system, with the potential of altering the pH, the buffer will keep the pH stable. This keeps the cleaning solution in your swab stable until removed from the paint surface, thus avoiding a change in cleaning action during the use of a single swab.

Stavroudis demonstrates the peculiar texture of the deoxycholic acid when insufficient 10% NaOH solution has been added to bring the pH to 8.5

The MCP uses acid and amine buffers from the biochemical industry to maintain the desired pH within the 5.0-8.5 range, and they require clearing with the equivalent pH-adjusted water. Into these buffered systems, designed to control swelling of the paint film, chelators and surfactants of increasing potency and affinities can be added.

Chelators

Fundamental to the use of chelators in these systems is the fact that aged dirt is held in place on a surface with metal ions, typically deposited from the surrounding environment, but conceivably also in some cases migrated out of the paint layer.

Two of the three chelators included in the aqueous cleaning set made during the September course were citrate and EDTA (ethylenediaminetetraacetic acid); these are well-known chelators to the authors, though EDTA's strong affinity for metal-ions and ability to sequester them into a water-based cleaning system makes it an agent used with great caution, especially on an unvarnished paint surface. DTPA (diethylenetriaminepentetic acid), a similar, but in theory even more potent chelator than EDTA due to its significantly higher formation constants, was also included on the list of chelators.

A useful point made by Stavroudis, and well worth remembering when using chelators, is how chelation is not just a lifting of dirt in its unaltered state; the chelator forms new complexes with the metal ions it sequesters, which may well have a different colour to the undisturbed dirt. This means that the material picked up on the swab can have a different appearance than you might expect, i.e. it might not look nearly as 'dirty' on the swab as it does on the paint surface.

Surfactants

A wide range of non-ionic and anionic surfactants is utilised in the MCP, employing the principle of 'like dissolves like'. Surface active agents (surfactants) – molecules with both hydrophilic and hydrophobic groups – are useful in encapsulating and removing grease, grime, and even oxidised resin found in surface coatings.

Various factors determine the choice of surfactant in a cleaning system, such as the CMC (critical micelle concentration), solubility in water, sensitivity to pH, and the HLB (hydrophilic-lipophilic balance number): the higher the HLB the better the dispersive action, which is roughly equivalent to surfactant strength; sodium laurel sulphate, for example, has the highest given HLB number of 40, making it a very 'strong' surfactant, used in many readily-available soap and shampoo products (but not in the MCP!).

The MCP guides the user in suitability, quantity and concentration of surfactant, and it is worth keeping in mind that for modern paints, surfactants with HLB numbers around 13 are often employed in the paint formulations themselves. [2]

Certain surfactants are useful in targeting particular materials: Maypon® 4C (HLB unknown) (potassium cocoyl hydrolized collagen) targets collagen, for example, and Brij® S 100 (HLB 18.8) (polyoxyethylene stearyl ether) pulls up fatty material. However, not all of the surfactants included in the range during the SAAM course are currently available in Europe.

A particularly interesting surfactant is the Pluronic® F-127 (HLB 22), also called Poloxamer 407. It is commonly found in mouthwash products and is a block copolymer consisting of a long propoxylate chain between two long ethoxylate chains. It is a very promising surfactant in conservation, because both the ethoxylate and propoxylate chains will break down over time, thus allowing for full volatilization of the surfactant (although if the painting is varnished shortly after cleaning, it is likely that its volatilization is affected).

Interestingly, during tests carried out on the course, addition of a surfactant was sometimes found to reduce the efficacy of a cleaning system, whilst another improved the cleaning effect. Sodium deoxycholate (HLB 17.6) is one choice of surfactant, which is likely to have an effect on an aged resin layer, being used in deoxycholic resin soap formulations that most painting conservators are familiar with already. Like the other resin soap systems, it will only work at a raised pH, which means that in the MCP context, it can only be employed with the pH 8.5 solutions
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Surfactants used in cleaning treatments are not materials that the authors are otherwise very familiar with, and the many different parameters mentioned above can make the safe incorporation of them daunting; i.e. what should the concentration be in order to have in excess of the CMC, but not more surfactant than strictly necessary? Which surfactants will work at a given pH? What is their strength and solubility? How do I best clear them?

This is where the MCP software is particularly helpful, because it does the concentration calculations for you and presents the surfactant options available to try with the other components you wish to use. And in all cases (for the aqueous MCP range), you can clear with the pH adjusted waters and trust that the surfactant will in fact be soluble/removable.

Gelling agents

A final step in the formulation of an aqueous MCP cleaning system is the option of gelling it. Again, several options can be employed within the MCP, including various methyl-cellulose-based thickeners and Carbopols®. In the newer range, Pemulen® TR-2 and xanthan gum (more recently introduced in conservation by Richard Wolbers) have natural emulsifying properties, apart from the ability to suspend the aqueous cleaning systems.

Xanthan gum is a natural polysaccharide with a cellulose backbone chain small enough to allow dissolution in water. It is stable within the relevant MCP pH range, and its thixotropic properties are conducive to making up a stock gel that will mix easily with the cleaning solution without becoming impractically runny. The cosmetic grade is furthermore a very clear gel with emulsifying properties that allow it to suspend up to 20% of low-polarity material, such as a low-polarity solvent, oily grime and particulate dirt.

On the downside, it is very prone to biological growth, so a preservative should be added (for example, Germaben™ II: a clear, viscous liquid, containing propylene glycol, propylparaben, methylparaben and diazolidinyl urea).[3] Pemulen™ TR-2 is a polyacrylate like most Carbopols®, but modified to have emulsifying properties. It is, however, more pH sensitive than xanthan, and it does not lend itself as well to being made into a stock gel to dilute with the other components in a MCP cleaning system, because it is too rigid to work with at the 5% stock concentration.

WHAT EQUIPMENT IS ESSENTIAL TO USING THE MCP?

Since achieving a specific pH is all-important within the MCP, a pH meter is an essential instrument for making up stock solutions and the pH adjusted water at the outset.

Some of the chelating solutions made up during the course were certainly tricky to get right, as the desired pH was just at the limits of the solution's buffering capacity, and a few drops too many of sodium hydroxide would greatly raise the pH. pH strips are too inaccurate to replace a pH meter, but Stavroudis recommends buying cheap meters online and replacing them when necessary.

The meters used during the course were the Hanna Instruments HI 98103B Beer pH Tester, which is sold for $36.95, but even cheaper meters are available from UK websites for around £10.[4] The pH meters should display two decimal points and allow for calibration at at least two standard pHs. Commercial buffer solutions at pH 4, 7 and 10 are employed for calibration of the meters.

While conductivity meters are useful, the recipes for the adjusted water used for clearing will get you close enough to the desired conductivity to make a meter non-essential; however, cheap conductivity meters are available to buy.

For measuring out the various components a two-decimal scale is necessary, and an American Weigh Scale Digital Gram Pocket scale, measuring in the range of 0.01 and 200g, was employed during the course. An equivalent scale can be purchased online for less than £10.

A large number of 125ml bottles with well-sealing lids (Teflon-coated lids were recommended by the course tutors) is necessary for storing the aqueous MCP components. The course participants brought home with them around 40 bottles, clearly labelled with the printable labels that can be printed off from the MCP software.

A range of chemicals in liquid or powder form already mentioned above is required. Some are likely to be part of the range in a painting conservation studio, others not. Some of the surfactants are not easily acquired, or only available in quantities suited for an industrial purpose. The implementation of them in the MCP is due to the fact that they are recent additions to the materials trialled and found to have promise by Richard Wolbers and, in consequence, some surfactants (Ecosurf® EH-6, Marlipal® 1618/25) and gelling agents (Pemulen® TR2, sold as 'Wetting Agent PM', and Xanthan gum) can now be purchased from Kremer Pigmente. *(Conservation Support Systems now has a Modular Cleaning Workshop Supplies section, listed under Products. Ed.)*

WHY USE THE MCP?

On the introductory page of the MCP software, Chris Stavroudis answers this question in straight-forward terms: '*This software is intended to fill the conceptual space between the practicing conservator and Richard Wolbers – sort of your own, private chemistry guru. The conservator understands how to control the removal of one component from another. The Modular Cleaning Program was designed to "do the chemistry' for the conservator, making it convenient […] to try a wider range of cleaning systems than they might normally use*.'

A particularly positive aspect of the Modular Cleaning Course was the fact that both tutors are practising painting conservators working in the private sector. The authors have both been participants in Richard Wolbers' recurring, week-long course on new methods of cleaning painted surfaces. However, we found that, while the principle of conductivity and the making of silicone-based emulsion systems sound both logical and doable, it is nevertheless a challenge to juggle the many new materials and parameters with confidence when back in the studio.

In conversation with other Wolbers course participants, we have heard similar difficulties expressed on several occasions: the course is excellent, but most of us feel a strong need to double-check our facts and cleaning solutions with Richard Wolbers before using them on a sensitive paint surface! An added practical challenge is the need for expensive kit. For example, the HORIBA pH and conductivity meters cost several hundred pounds each, making them quite an investment.

In the MCP course, Chris Stavroudis employs much cheaper meters and scales for weighing out the various components, and the theory on which the MCP hangs is brought into a pragmatic framework that makes it practical and approachable to the course participants.

While measuring the pH and conductivity of actual paint surfaces has been a strong focus in previous CAPS and Wolbers workshops, the cumulative information on pH and conductivity that has been gathered from an increasing number of modern paint films now allows for certain assumptions. While the MCP gives you the option to enter actual pH and conductivity measurements from your specific painting, a standard set of buffers for pH 5-8.5 and 1000S/cm^3 or 6000S/cm^3 conductivity were made up during the course.

With a basic knowledge of swelling ranges for oils/acrylics and their typical surface conductivity, the standard set gives the conservator the possibility of operating within relatively safe, low swelling parameters.

While it should be stressed that the MCP software by no means tells you how to clean your painting, it does allow you to systematically increase the potency of your test solutions according to your own pre-existing knowledge, while maintaining the pH and conductivity you deem least likely to swell your paint surface.

The computer programme allows you to skip the leg-work of doing the actual calculations to find out exact proportions of each component in a successful mixture. It also limits the making up of incompatible solutions by eliminating the additives that would not mix, thus saving you from making 'failed' mixtures.

WHAT ABOUT CLEARANCE?

The aqueous range of the MCP employs a host of chemical compounds that are not part of the painting conservator's tried and tested standard range. MCP cleaning solutions, depending on their complexity, can contain acids and bases used to buffer the pH and conductivity, chelators, surfactants and gelling agents, all of which need to be cleared. Finding a clearance solution is not a complicated process, however, as all compounds can be cleared with pH-adjusted water at the same pH as the cleaning solution itself.

CASE STUDIES

1) Early twentieth century (?) unvarnished landscape painting, oil on canvas with an accumulation of surface grime.

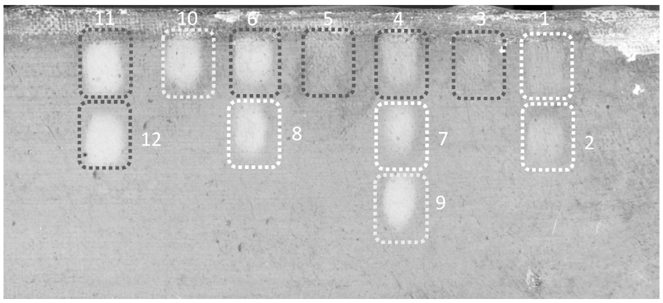
The Hamilton Kerr Institute holds a small number of donated, deaccessioned paintings (unattributed) from the nearby Saffron Walden Museum, all of which have a considerable build-up of dirt and finger marks, which makes them ideal candidates for the MCP aqueous cleaning range.

Initial surface cleaning tests with deionised water and saliva were carried out with little effect on the dirt, although saliva worked markedly better than water.

The buffered solutions at pH 5.5 and 7.5, equally had minimal impact on the dirt layer, but the buffered solutions at pH 6.5 and 8.5 both had a moderate to fair cleaning power.[5] Since the lower pH of 6.5 seemed to have as much effect on the dirt layer as pH 8.5, further tests were done at this lower pH since, theoretically, the paint is less likely to swell at a lower pH.

Within the MCP, the logical next step was to add a chelator to the pH 6.5 buffer. Sodium citrate [6], the mildest chelator in the aqueous range used during this course, was tested first, which further improved the cleaning in removing the majority of the dirt, however with some remaining in the troughs of the paint surface.

In the solutions set made during the course, the next chelator to try is EDTA, which may not be the next chelator that *every* painting conservator would choose. However, the MCP software will allow you to create your own solutions sets, and based on the components you add to it, the programme will propose options out of your set, in order of increasing potency.



1	Deionized water	7	pH 6.5 buffered (1:4)
2	Saliva	8	pH 8.5 buffered (1:4)
3	pH 5.5 buffered (neat)	9	pH 6.5 buffered, EDTA
4	pH 6.5 buffered (neat)	10	pH 6.5 buffered, citric acid
5	pH 7.5 buffered (neat)	11	pH 6.5 buffered, EDTA, Maypon
6	pH 8.5 buffered (neat)	12	pH 6.5 buffered, EDTA, Ethofat

In this cleaning test, exchanging citrate for EDTA gave an excellent cleaning result, but for the sake of the experiment, a surfactant was added to the system: a test solution with the addition of Maypon® 4C (potassium cocoyl hydrolized collagen) was found to be highly effective at removing dirt, as did a test solution with Ethofat® 242/25, however both seemed to affect the oil paint, leaving it slightly matter than the former tests after clearing. The matting effect could indicate that the surfactants may be affecting the paint film binder, and it was therefore deemed an unnecessary, and potentially damaging, addition to the cleaning solution.

2) Interior Scene, Steenwyck (att.), seventeenth century, private collection, oil on panel with aged varnish layer and possibly embedded dirt.

An upper, aged varnish coating was removed easily from this small panel using a standard mixture of free solvents (ethanol in a low polarity hydrocarbon solvent in the proportions 1:3). However, an older, yellowed and poorly saturating coating remained, which was insoluble when attempting to lift it with polar solvents mixtures.

Deoxycholic acid resin soap made with TEA (triethanolamine) at pH 8.5-9 (not an MCP-built system) had very limited effect, lifting some material in a patchy fashion while leaving the surface somewhat blanched – an indication that the aged varnish had likely been affected to some extent. A grey cast indicated the possible presence of ingrained dirt, and the MCP aqueous range was therefore tested.

As expected, none of the buffered waters at pH 5.5 – 8.5 had an effect on their own, but since the resin soap at the raised pH of 8.5-9 had slightly affected the coating, citric acid – for its chelating properties – was added to the pH 8.5 buffered solution; however, it did not improve the cleaning action.

EDTA, with the pH 8.5 buffer, clearly removed some of the grey material, but the degraded varnish remained. Gelling this solution with xanthan gum to add emulsifying properties to the system did not make a difference.

Back-tracking from the xanthan gum, surfactants at rising HLB numbers were tested next in combination with the pH 8.5 buffered solution with EDTA. Maypon® 4C was tested, in case an animal glue might be present on the surface from a previous consolidation campaign; however, this surfactant had no effect. Pluronic® F-127 was tested next, but again, did not improve the cleaning ability of the solution.

On the assumption that an aged resin with imbibed dirt was still present, sodium deoxycholate was the final component in the surfactant range tested, in the hope that it would supplement the EDTA chelation of the dirt present; the affinity of deoxycholic acid with aged natural resins is well known.

This solution worked extremely well, and dirt and resin were lifted successfully. For the sake of understanding the action further, a solution was made omitting the EDTA, but retaining the sodium deoxycholate. This had no effect, showing that the combined action of the chelator and surfactant was necessary. The cleaning solution was cleared with 8.5 pH adjusted water at 1000 μS/cm.

The advantage of using this cleaning solution, arrived at systematically by working through the gradual addition of MCP components, is the relatively low and consistent pH, and the fact that no solvent swelling action is employed – unlike the resin soap, trialled first with moderate success, which contained TEA; furthermore, clearance of the MCP components was found to be easier than clearing TEA.

THE MCP EXPANDING: SOLVENTS AND EMULSIONS

Stavroudis also touched on the option of adding a small proportion of a co-solvent (such as n-butanol or benzyl alcohol) to the cleaning system in combination with thickening it with xanthan gum. In this case only a small amount of solvent is added, typically 2%, which is dissolved into the aqueous system. As xanthan and Pemulen TR-2 both have emulsifying properties, it is possible to emulsify a solvent phase *into* the water already present in an aqueous MCP cleaning solution. An MCP oil-in-water macro-emulsion system can still be cleared with the appropriate pH-adjusted water.

As the course outline promised material on cleaning water-sensitive surfaces, Stavroudis also demonstrated the use of silicone-based solvents. This was clearly the area of greatest excitement (and potential) for Stavroudis himself, based on the unique properties of silicone-based solvents: very low polarity, low to no odour, 100% volatile, miscible with polar and non-polar solvents, comparatively safe.

Since they have little or no interaction with most materials, they offer the conservator a hydrophobic barrier through which to deliver a cleaning system to a surface. The silicone effectively floods the surface, protecting it from the aqueous components, though it may also slightly impede cleaning action. Silicones can also be mixed with solvents to 'thin' varnish layers.

The silicone vehicle demonstrated on the course was Velvesil* Plus – a silicone polyether co-polymer that comes as a very thick paste which can be thinned with cyclomethicone until workable. To this it is possible to add pH-adjusted water, or another aqueous component of the MCP such as a chelator. An even finer emulsion is achieved if the mixture is exuded from a syringe (also good for storage).

Not a great deal of time was spent on the use of silicones on this course, but they will no doubt feature heavily in Stavroudis' continuing research. At this time, he was keen that the course participants should witness the ease with which they can be employed (whilst acknowledging difficulties encountered due to their 'greasy' feel, and tendency to spread indefinitely.)

CONCLUSION

A five-day MCP course with Chris Stavroudis will be offered through International Academic Projects, London, in 2017 (provisional dates, 9-13 October). We hope this article has wetted your appetite for becoming further acquainted with it.

While the MCP is by no means for the novice, it successfully incorporates a rather complex number of considerations and factors to keep in mind when approaching the cleaning of sensitive, younger paint films, and it can be equally effective on older paint surfaces, as two successful removals of oxidised varnish with imbibed dirt undertaken at the HKI since the course have demonstrated.[7]

Stavroudis stresses the fact that the MCP software does not tell you *how* to clean a painting. But if you tell it *what* you wish to test, it will help you formulate a functional, stable solution, saving you time by making the necessary calculations for you. The methodology also makes fine-tuning easy and straight-forward, and it allows you to gradually increase the potency of your cleaning system, while remaining within the 'safe' pH and conductivity range.

The strength of the MCP is not that it introduces a radically new set of cleaning tools. It does however greatly facilitate the incorporation of the principles and approaches introduced in the CAPS workshops and the research of Richard Wolbers: a complex and rapidly developing body of knowledge that can otherwise be a challenge to take on board in our everyday painting conservation practice.

ENDNOTES

1. We are grateful to Chris Stavroudis for invaluable input and clarification, to the SAAM Lunder Conservation Center, to Amiel Clarke and Emma Janssen at the Hamilton Kerr Institute.

2. The HLB for Triton X-100 for example, a surfactant that until recently was used in paint formulations as well as in conservation, is 13.4. Stavroudis stresses that the HLB is really an inadequate indication of the 'strength' of a surfactant in a conservation context, but no better measure is available.

3. Germaben® II is not readily available in Europe. As an alternative, the HKI are currently testing Plantaserve® E, a phenoxyethanol and ethylhexylglycerin preservative used in the homemade cosmetics industry.

4. The Hamilton Kerr Institute recently purchased the Selmos High Accuracy Digital pH Meter Pen Water Quality Tester with Large LCD 0-14pH Measurement Range 0.01 Resolution, which comes with two sets of powder calibration pouches at pH4 and pH7 and has performed well, although it consistently read pH about 0.2 – 0.4 higher pH than our Horiba pH meter.

5. Testing the efficacy of water at different pH levels can be done with either the adjusted waters, or with the buffered solutions (diluted from their concentrates with deionized water 1:4 to make the 5ml test solution). However, as we tested with the buffered solutions, clearing with adjusted water is necessary, and it would arguably be faster to do the testing at different pH with the adjusted waters.

6. To make the test solutions for this chelating agent, sodium hydroxide solution is added to the citric acid solution until the desired pH is achieved. Once the pH rises above 7, the solution will contain tri-sodium citrate and excess sodium hydroxide. Below pH 7, the solution with contain mono-, di- and tri-sodium citrate in varying proportion.

7. The first successful cleaning is discussed in case study two. Another seventeenth-century oil on canvas currently in the studios showed a somewhat similar, yellow-grey residue layer, after the successful removal of the upper varnish film with free solvents. At the time of writing, the layer is being removed successfully with an MCP system consisting of buffered water at pH8.5, EDTA and Ecosurf EH-6 surfactant. Again, testing EDTA and surfactant on their own had limited effect, and a deoxycholic resin-soap none.

The Modular Cleaning Program: First Impressions from a Four-day Course and Subsequent Implementation, continued

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RECOMMENDED VIEWING

Getty Conservation Institute videos prepared for the Cleaning Acrylic Paint Surfaces (CAPS) workshops.

Calibrating Conventional pH Meters
https://www.youtube.com/watch?v=9Ktlz0uw6kw

Calibrating pH and Conductivity: Horiba Meters
https://www.youtube.com/watch?v=_nx3gNnKsUE

Preparing pH- and Conductivity- Adjusted Water
https://www.youtube.com/watch?v=hGAUAgNYZjI

Preparing a Pemulen Gel from MCP and Making an Emulsion
https://www.youtube.com/watch?v=2O5pYyc45Qo

Making Agarose Gel and Preparing an Agarose Plug
https://www.youtube.com/watch?v=SX4n2DO6Lao

Measuring Surface pH and Conductivity Using Water Drop and Agarose Plug Methods
https://www.youtube.com/watch?v=bOqZEE7Kb8Y

Mixing and Using Velvesil Plus
https://www.youtube.com/watch?v=i6cet8sa-6Y

Preparing a Dow Mineral Spirits Microemulsion (With Cosurfactants)
https://www.youtube.com/watch?v=SGkf3i7rnDw

Preparing a Silicone Microemulsion (With Cosurfactant) – [without cosurfactant]
https://www.youtube.com/watch?v=xDpwloLqJS4

In theory, there is no difference between theory and practice.
But in practice, there is.

Jan van de Snepscheut

Membership

Chris Stavroudis
membership secretary