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JUST PAINT

SPECIAL CONSERVATION ISSUE

Numerous professionals in the field recently attended the Modern Paints Uncovered Symposium at Tate Modern in London to learn about research regarding modern materials.
Photo courtesy of Andrew Dunkley, Tate Photography

Modern Paints Uncovered Symposium at Tate Modern in London

By Mark Golden

Modern Paints Uncovered, the recent symposium held at Tate Modern in London, which was co-organized by the Getty Conservation Institute, the National Gallery of Art in Washington, D.C. and Tate, drew together the varied strands of research currently being conducted by conservation scientists and conservators on modern paint materials and addressed some of the concerns associated with these paints and the challenges inherent in developing appropriate conservation protocols.

Most of the issues relevant to the conservation of these modern materials is still unclear and needs further investigation. The MPU symposium was intended to take stock of where the research is and where it's proceeding, to provide conservators with new resources and to eventually provide artists who are concerned with the longevity of their artwork with accurate information. Although many topics were covered, much of the symposium was focused on three areas: improved methods for analysis, better understanding of the physical properties and surface characteristics of modern paints, and assessment of the effects of cleaning treatments on acrylic emulsion paints.

As a follow-up to the event and in an effort to gain an even greater understanding of modern materials (especially acrylic paint), GOLDEN recently invited four very distinguished individuals who are right in the center of this work to participate in a conference call to discuss what their research and investigation has meant to them and the field.

Participants of the call included Dr. Tom Learner, the Senior Conservation Scientist at Tate in London and the host of Modern Paints Uncovered. Learner has also been the lead researcher in the consortium developed between Tate in London, the Getty in Los Angeles and

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From Formulation to Finished Product:

Causes and Potential Cures for Conservation Concerns in Acrylic Dispersion Paints

By Jim Hayes

From time to time - I know you may be surprised to hear this - we've been accused of being just slightly too technical in our *Just Paint*. In an effort to be accurate we have sacrificed some potential readership. Others have simply shared with us that they've been able to replace their sleeping aids without the side effects of sleep eating. I have taken a stab at creating a summary of a paper that I had the good fortune to collaborate on with Dr. Gregory Smith, the Andrew W. Mellon Assistant Professor of Conservation Science at Buffalo State College.

I hope that I can do justice in translating the essence of our presentation so that it might be of greater value to the professional artists who enjoy the science behind what we do.

Introduction

Paint formulation is a balancing act of both complementary and competing aims. The formulator (me) dials in properties like film flexibility and toughness, adjustable drying times, a variety of sheens and textures in order to deliver a high value, safe, waterborne paint. The physical and chemical properties of the water-based acrylics, (correctly titled acrylic dispersion paints) are largely determined by choices made at the point of product formulation. The selection of binder material and additives impart the many celebrated characteristics of this medium; a waterborne coating that dries quickly, is resistant to photodegradation and remains tough, yet flexible.

However, most of these choices bring with them concomitant properties that often are not desirable. Many of these characteristics are a source of concern for

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the National Gallery in Washington, D.C. Joining the call from Kingston, Ontario was Dr. Alison Murray. Described as "Canada's number one chemist to the arts," Dr. Murray is a leading conservation scientist and professor in the Art Conservation Program at Queen's University, who has conducted a research program for optimizing cleaning treatments used in the conservation of acrylic paints and grounds, which integrates information including mechanical testing data, chemical analysis, and surface analysis. From Buffalo, NY, was the panel's third conservation scientist, Dr. Gregory Smith, who is the Andrew W. Mellon professor of conservation science at Buffalo State College and previously the lead investigator at the National Gallery of Art in the study of the acrylic dispersion system. And lastly, GOLDEN Technical Director Jim Hayes also joined the discussion. Jim has managed all of the research and development functions at GOLDEN for the last 20 years. Hayes also leads its Custom Lab, making individual products for artists as well as for the conservation community.

Major portions of this conversation are included below. If you are interested in reading the complete transcript, you can find it on our Web site at www.goldenpaints.com.

Mark Golden (MG): We are delighted to be able to bring together a collaboration that truly bridges our fine arts community for the discussion of how to care for and treat acrylic paintings.

So, to help us accomplish this, I am joined by Dr. Tom Learner, the senior conservation scientist at the Tate in London, Dr. Alison Murray, Associate Professor in the Art Conservation Program at Queen's University, Dr. Greg Smith who is the Andrew W. Mellon professor of conservation science at Buffalo State College, and finally, my colleague Jim Hayes, the technical director at Golden Artist Colors. Good morning, or good afternoon everyone.

> "...A COLLABORATION THAT TRULY BRIDGES OUR FINE ARTS COMMUNITY FOR THE DISCUSSION OF HOW TO CARE FOR AND TREAT ACRYLIC PAINTINGS."
> *Mark Golden*

MG: Alison can I ask you a favor? Could you describe the difference between a conservation scientist and a conservator?

Dr. Alison Murray (AM): Conservators do hands-on treatments and preventive conservation; they have to understand about the history and the context of the painting or object. Conservation scientists have a background in science, chemistry for example, or engineering. They're interested in performing research and analyses related to the work of conservators. Conservation scientists might identify materials to understand whether an object is a fake or a forgery. And so, conservation scientists don't do the hands on treatment, but they understand what the conservators are doing and they try to provide the conservators with the necessary scientific information wherever possible.

MG: … Jim, you've been working with the conservation community for some time now. Can you describe the benefits of being able to work with this community in pursuing your own work?

Jim Hayes (JH): I feel a key benefit is in realizing that the conservation community is really an extension of ourselves. These folks get to see our products used in real life situations, and the impact our products have on the properties of the finished artwork, both good and bad… This relationship yields valuable information that as a responsible manufacturer we then utilize, trying to improve the quality of our paint to potentially overcome some of these weaknesses. I think also in collaborating with the conservation community, it's great that we gain access to not only some incredibly bright scientists who have chosen to be part of the modern materials field, but also we gain access to their facilities and instrumentation. This is proving pivotal in being able to analyze and understand these materials at a much deeper level.

MG: Tom, if I can characterize this correctly, you've been asked to take the lead in the consortium of institutions, including your group at Tate, the National Gallery, and the Getty Conservation Institute (GCI). And, if you could, please describe the process that brought these groups together to begin to answer some of the critical questions surrounding these modern materials.

Dr. Tom Learner (TL): Sure. …there were a couple of quite key meetings in the very early part of this decade – in Paris in 2000 and in New York in 2001. …Both those meetings required funding to get everyone together, and that was largely supplied by the Andrew W. Mellon Foundation – which has been extraordinary in pushing research and funding for research in this and other fields – but also the GCI, the Getty Conservation Institute, co-organized the New York meeting.

So what happened at both those meetings was a discussion about the conservation concerns and need for research into all sorts of different materials ranging from modern plastics to installation art, and from the dyes in inkjet printers to modern paints. I saw that we – as a profession – seemed to be extremely capable of identifying many of the conservation problems of a whole gamut of modern materials, but we seemed far less capable of moving on from that and coordinating the research to address some of those problems. I felt we were just becoming overwhelmed with the scale of the problem and had become obsessed with wanting to tackle it in its entirety, and that required prioritizing the resources, which was an impossible task. I mean, how do you agree to put

the needs of one artist's work or one type of material over another artist or type of material? It's such a subjective consideration…

So I just felt we needed a group to start looking for some of the solutions, and the decision on what we were going to work on was not necessarily going to be based on the types of materials that were most in need of research, that's to say those that were most likely to fall apart before our very eyes. Instead, I wanted to base it on what could be accomplished most quickly, and I felt that with my background and those of other people at the meetings there was a huge potential for research on modern paints. The other justification for looking at paints was that painted surfaces are obviously a hugely important part of most collections…

…I was the person who actually proposed the idea to the National Gallery and to the GCI, and they both said yes. It has been a superb venture, and the symposium (that I know we're going to talk about later) really was a milestone in terms of taking stock of where the research has got to after three years. Now it wasn't just this partnership that has looked into modern paints, of course. Alison's group at Queen's, and other groups in Europe and North America have been doing work as well, so we wanted to open the symposium up to the entire profession, so we could all see how far we have got with the research, identify where the thinking was going, and hopefully to get more dialogue going…

MG: Alison, obviously you folks have been investigating modern materials at Queen's since at least the mid-90s… Can you share some of the areas of research that you and your students have advanced?

AM: I've been working with conservation students at Queen's, as well as with conservation science students. We try to tailor the different research projects to a student's background and interests. For the science point of view, our approach has been to look at the problems from different angles: we carry out mechanical testing, so understanding more about the stiffness and strength of materials; we look at any chemical changes; and we also look at the surface of the materials to determine if there are any changes in roughness, in gloss, in color. We've tried to approach the problem in different ways. So far, we've examined different acrylic paints and grounds, and we've tried to understand the materials themselves, how they age and how their material properties change when the temperature or relative humidity is altered. We wanted to know what happens when paints or grounds are exposed to water, so we've done some swabbing and some immersion tests as well.

We've tried to quantify the different changes that the various materials undergo. And, we've been able to capture or understand the different variables. For example, the various manufacturers of acrylic paints will obviously include different ingredients in their paints and these are proprietary and change over time. Paints with different pigments will also have different properties. We want to make statements about the trends, realizing there are such huge numbers of parameters.

As we've looked for trends, we've been able to come to some conclusions, but more needs to be done. We also have to ask, if we see changes, how important are they? As well as using test samples, we are looking at treating actual works of art and, as well as working with students, we are working with conservators who are out in the field. That's the second part of the project: we have applied these various scientific techniques to materials, but now we have to see how we can synthesize our results so that they are useful to conservators…

MG: …Greg, your work had also been particularly important in creating a baseline for studying acrylic medium, even to the point of developing instrumentation and new ways to analyze the material. Can you describe, maybe to an artist why that particular goal was so important and its value to understanding the acrylic medium?

Dr. Greg Smith (GS): Sure. Some of that arose from frustration at what Alison was describing. That when you're looking at paints out of the tube, there are so many variables and unknowns about the material depending on the manufacturer, the pigments and all the other ingredients that it becomes hard to try and understand what your results mean. And so, I took a step back and began with something easier and simpler just by removing a lot of the unknowns and starting with the basic binder material, the acrylic emulsion.

So a lot of my work has been on Rohm & Haas acrylic dispersions and some other European manufacturers of the basic acrylic emulsion. I have been trying to understand how the emulsions behave on their own and then hopefully trying to find some generalizations in my data that can be applied to all of the artist paints out there. And of course, understanding that as it becomes more and more complex in the formulation that the behavior of the paints will be changed somewhat. To that end, the custom formulation work that Jim Hayes has done for me has been invaluable. By making paints of known composition, you can get around a lot of the uncertainties of using commercial products.

"…WHEN YOU'RE LOOKING AT PAINTS OUT OF THE TUBE, THERE ARE SO MANY VARIABLES AND UNKNOWNS ABOUT THE MATERIAL DEPENDING ON THE MANUFACTURER, THE PIGMENTS AND ALL THE OTHER INGREDIENTS…"

Dr. Greg Smith

In order to undertake these studies, I had to work first on developing some analytical protocols that would allow me to determine the components of the acrylic emulsion. And then, with that being a fundamental development, it

can now be applied to the commercial paints and to other modern materials.

…Now I've started to accumulate data and some understanding of how these emulsions behave. And, looking forward, the research topics that I'm developing currently are trying to make further sense of the behavior that I've observed. As an example, we talked a lot at the symposium about surfactants and the tendency of surfactants to migrate to interfaces and how this can be problematic in terms of optical clarity, adhesion and dirt pick up. A lot of my work was looking at what happens when these are removed, how is the paint film affected? We know that if you remove the surfactants, which have a plasticizing effect on the film, the films become firmer.

"...CONSERVATORS SHOULDN'T WAIT AND SIT BACK AND ONLY DO THINGS WHEN THEY'RE TOLD THAT THEY'RE OK, THAT SOMEHOW SCIENCE IS GOING TO GIVE THEM COMPLETE ASSURANCE THAT A PARTICULAR TREATMENT IS 100% SAFE."

Dr. Tom Learner

The big question now is, of the changes that we have observed, how meaningful are they? Is washing the surface a good thing to do to an acrylic painting? Obviously, if optical clarity is a problem, the only way to improve that is to wash the surface. However, if we remove surfactants from the surface, does that affect the hardness of the surface, the ability of that surface to pick up dirt? Does it affect the purported static charge that acrylics are supposed to carry? Now I'm developing techniques to try and measure those practical properties of emulsion films…

MG: I was going to ask this question a bit later, but I think I might ask it now as there was quite a bit of work done in understanding surfactants. I know this is probably an unfair question to ask, but it is about the ethics of conservation. How do you think the debate amongst the conservation community is going to resolve as to the removal of an ingredient from a finished painting?

TL: I'd be happy to start off here – although I'm sure we've all got things to say on this one. This should be approached as a debate that has to involve not just conservation scientists, but also conservators as well as curators and artists. But it is good that conservators are having these discussions now, while so much research is going into the scientific study of the subject. Now, if conservation scientists do show – for example – that surfactant does comes to the surface on these paint films in real situations, and that it can be removed with cleaning, and that if it is removed then it's not really problematic in terms of the resulting paint film still retaining sufficient flexibility, so that the potential changes that occur with its removal are so small compared to other changes that could happen. If all that is demonstrated, then the question about whether it is right to remove it or not does become more ethical. Personally, I think we have to consider this more widely than just worry about one of the components in the acrylic paint films, especially because conservators do remove original material in other instances. The obvious example to compare this to is oil paints. There's a fairly common problem that happens in oil paintings from the mid 1920s to the early 1940s that have not been varnished, where you can get a crystallization appearing, an efflorescence that originates from the oil paint, usually in certain colors, and it grows on top of the paint surface and quite quickly becomes extremely disfiguring to the image. Now, we don't fully understand the mechanism or cause of this yet, although there are certainly theories that it has to do with moisture gradients, or maybe something to do with extra additives being added to the oil paint to help the wetting of pigments. But, whatever's causing it, we know the crystals are fatty acids – you can confirm that with analysis, and they are part of the original oil paint that have detached themselves from the main oil network and have migrated to the paint surface and are causing an optical problem. And as I say, often it's quite an extreme optical problem. And, although some conservators do question this, it is very common practice to simply brush the crystals off the surface. They usually brush off very easily, and you don't cause any damage to the paint film. Sometimes you can't get it all off, but you can certainly get most of it off and then you might consider a little bit of water to help the final removal, or some slight heat just to re-dissolve the crystals and get them to go back into the film. But, whatever you do, you are removing original material from that paint film. And that seems to be OK, ethically speaking, for conservators. If someone presents that kind of treatment at a conference, nobody will stand up and accuse them of irresponsibly removing original material.

So, I think the same kind of criteria has to be applied to acrylic paint. So if the surfactant is an original part of the paint that has now ceased to have a real purpose…and if it's causing an optical problem or if it's causing a problem that might, for example, increase the likelihood of dirt pickup, then I think there's a very strong case to argue that it's acceptable to clean acrylic paintings with water, which we know now does remove these surfactants very effectively.

But, it is interesting though. I think in the symposium, if I remember correctly we heard different scientists take the whole spectrum of opinions, from the one who said 'no, you should not clean with water because you're going to remove surfactant', all the way through to 'yes, you can clean with water and yes, you will remove surfactant, but so what? This will change the paint so minimally'. So that's how I see it: that the profession has to be realistic, but it does have to involve every part of this profession, not just the scientists.

GS: And, I might add something here as well. In terms of removing this material, Tom was saying that the changes may be so small that they don't matter. That's one of the things that needs to be looked into a little bit further. Removing these materials may actually help the painting, for instance, in the amount of dirt pick

up. That would make aqueous cleaning a kind of preventative treatment for acrylic paintings. Thinking about it in those terms may affect that debate over whether it is wise to remove this "original" material or not.

TL: Absolutely. And conservators will play a very important role here too. Acrylic paintings are being cleaned with aqueous treatments and they are being cleaned with dry treatments. So there will be some cases where surfactant is being removed from the surface, even if you can't actually detect it with your eye, and other cleaning situations where it probably isn't being removed. So we already have the situation where different kinds of treatments are being applied to the paintings, which is always a really – and this is the conservator speaking in me now – useful and important part of conservation research. The point was raised right at the end of the symposium that conservators shouldn't wait and sit back and only do things when they're told that they're OK, that somehow science is going to give them complete assurance that a particular treatment is 100% safe. Not only is that simply never going to happen, even if it did we'd end up with every conservator doing the same thing on every painting and there would be very little way of judging the success of a treatment years down the line.

You know, the scientific research can get us so far, but it is always so full of problems and uncertainties. For example, trying to mimic natural ageing processes with artificial methods is very difficult and very imprecise. I mean, how would you define 'natural ageing'? Is a painting hung in a tropical environment with almost no humidity control or light/UV filtering going to age in the same way as the same painting hung in a museum with very strict environmental control? Of course not. In the same way, there is a huge problem with trying to apply what we're doing on our test materials to actual painted works of art. Greg mentioned that much of his work on the unpigmented acrylic medium might be heavily altered by the presence of pigments in a paint formulation. But even if you look at pigmented samples, our test panels are probably very different to what is actually on a painting, where a paint film could've been thinned, extended, mixed – anything could've happened to it…

> "YOU KNOW, THE SCIENTIFIC RESEARCH CAN GET US SO FAR, BUT IT IS ALWAYS SO FULL OF PROBLEMS AND UNCERTAINTIES."
> *Dr. Tom Learner*

So, it is very important that we monitor how these paintings are behaving after treatment, and learn empirically as well as scientifically. And that means the high importance of proper documentation by conservators so that we know the exact history of this acrylic painting compared to that one, for example that this one's been cleaned with water twice over its 20-year life and this one hasn't and therefore, might be able to relate the changes we're seeing on the surface to its known history of cleaning treatments.

> "SO, IT IS VERY IMPORTANT THAT WE MONITOR HOW THESE PAINTINGS ARE BEHAVING AFTER TREATMENT, AND LEARN EMPIRICALLY AS WELL AS SCIENTIFICALLY."
> *Dr. Tom Learner*

MG: Tom…as the organizer of this incredible symposium, Modern Paints Uncovered, what were you hoping to accomplish with this event?

TL: I can't take full credit for this at all, because as part of our collaboration with the Getty Conservation Institute and the National Gallery, there's always been a dialogue between the three institutions about how best to get this information out…

My main aim for this was to have a really decent spread of presentations, from scientific studies to those on practical conservation, to enable the dialogue between those two groups, as well as others of course, such as paint makers and educators, and to really get people to open up. I had to put most pressure on conservators to present work on their practical treatments. We can spend a lot of time talking about this, but it's one of my big concerns at the moment of how to get over this problem of conservators not saying anything about what they do. There has been a real drift towards very preventive measures – which of course is fantastic for preventing problems rather than curing them. But there are times when preventive measures are not appropriate or just too late, and if conservators are putting off having to deal with these issues more and more, it does get very difficult to move the field on…But I was able to convince a few speakers to describe treatments and for me these were the highlights of the symposium…

From the conservators point of view I hope that they now know a bit more about the level and the kind of research that's going on and feel that they're able to play more of a role themselves. And for the scientists, I hope they have heard conservators speaking about what they feel are the problems now, the real practical problems…

MG: It was an exceptional event with a lot of great moments and a lot of great papers. Jim, were there any particular events or studies that stood out for you?

JH: Well, at the risk of not saying all of the presentations were elegant and insightful as they clearly were, there were a few that stood out for me. As a paint manufacturer, I thought one of the great moments was when Christina Young was discussing the interfacial interaction of layers and showed studies that suggested that the acrylic gesso underneath an alkyd in fact reduced the tendency of the alkyd to crack. We all know it's not widely agreed upon in the art world or the conservation world whether the acrylic gesso under an alkyd or an oil is an appropriate ground. From our side as a manufacturer of an acrylic gesso, we've always supported that the use of our gesso as a ground for oils and alkyds is a good practice, so it's very nice to see Christina's results supporting such.

Another very interesting paper, again, from the manufacturers' side, was the work reported by Stefan Zumbühl regarding the impact of water and solvent…on the paint film. …I felt that the image showing negligible change resulting from the water treatment supports that water very well may be a wonderful tool for the conservator to clean paints…

Another 'Aha!' moment was the air of openness of conservators sharing what they're doing, what techniques, whether experimental or not, they're working with. The fact that they are working with water and they're willing and able to discuss this in an open forum was refreshing.

MG: Greg (was)… there any specific paper or group of papers that were particularly insightful and…

GS: Yes, as Tom said, hearing the conservators talk about what they actually are doing with these modern artworks was really interesting. As a scientist, there were also lots of things presented that I had been wondering about or things that I had always supposed to be true but didn't know for sure. I kept a list of key points for me that were brought up in the lectures, and I can just run through those…

The whole talk about water mixable oils was fascinating. I hear a lot about them as a new medium, but had no idea how they worked or what the real chemistry of those products is.

Paul Whitmore's paper on how water rapidly diffuses through thin acrylic films was very insightful, and especially for those of us who have been doing immersion treatments. He reported that the films can be totally permeated in five minutes time and that adds a lot more relevance to the results of those immersion treatments and explains some of the rapid changes in properties that we see with even very short immersion times. Finally, co-presenting the paper with Jim was eye opening for me to finally hear about all the different experiments, which he has performed. I always knew that GOLDEN had not been resting on its laurels, but was always looking to build a better paint system… Even though I was involved in that paper, it wasn't until the presentation that I saw some of the results of these studies and they were very interesting.

MG: Thanks, Greg. Alison, I'll ask the same question to you, were there any discussions or papers that were particularly insightful or meaningful?

AM: I think what has been said already is really true. Sometimes the meaningful parts for me were in informal settings at lunch, or in the discussions after the talks! Bronwyn Ormsby did a wonderful job of bringing together all the research that she has done – it was a tremendous amount of work to synthesize all the results in order to come up with some specific advice for conservators. It was wonderful to hear that water is a promising choice of cleaning material when compared with other cleaning materials. Our group has done much work with water, first because we needed to focus on just a few variables and also because other groups were working on the cleaning media question. It is great that the work we've done will be of direct use. I thought that it was interesting to hear Paul Whitmore's paper about water diffusion after having read Stefan Michalski's related paper about oil paints. It was also really good to hear all the minute scientific detail and then to hear the conservators talk about the practical, hands-on work that they were doing.
You feel that there is still so much ground to cover.

"IT WAS WONDERFUL TO HEAR THAT WATER IS A PROMISING CHOICE OF CLEANING MATERIAL WHEN COMPARED WITH OTHER CLEANING MATERIALS."
Dr. Alison Murray

MG: ...Do you think that the conservation scientists will give at least some basic kind of treatment ideas to treat some of these modern materials or is it just simply too soon? Tom, you spoke about practicing conservators discussing treatments, do you think that from this event, maybe some new people might be willing to stand up there and present?

TL: Oh God, I hope so. I mean, if that happens it would be wonderful. And, you know, there are two parts to this that we wanted to accomplish at the symposium – the first of which was to show that conservators could stand up and talk about their treatments, which we did. And the second was to make sure that they weren't shouted down by colleagues, which we also achieved…

I think it helps put this into context if we step back and assess what research has gone into how best to clean oil paintings. The basic understanding that most conservators have was work done back in the 60s by Nathan Stolow, looking primarily at very young lead white in stand oil paint films, some of which may have been artificially aged. He was looking at the swelling properties of one paint film in different solvents and from that we can draw a Teas Chart, which is something that every conservator would be familiar with, and graphically depicts the effects of different solvents on a material depending on parameters such as their polarity. It is a way of visualizing the effect of each solvent that you might use to clean off a natural varnish from an old paint film. The Teas Chart is pretty much embedded in our brains, especially the area on it where oil paint swells the most – you try and avoid that area at all costs!

But that's basically what conservators have in their minds when they're looking at how to clean an oil paint film. If you really think about it, it is just a few scientific experiments done on not real paints, not properly aged, a long time ago. I think with acrylics we've actually already gone way beyond that with some sophistication. But still it remains true that there are clear limits to what science can do to help devise, understand and monitor what happens when you clean an actual painting.
So all of us here will only get so far with our paint-outs. We may only get to look at four or five different paints, because there's so many variations to consider – so many ingredients that are put into these paints. We can

never look at every brand, every year, every color of acrylic paint. So it does need the dialogue and it does need more conservators to try things out on real situations, although within reason! I am not saying that I want them to be irresponsible! It just needs getting back to the basic idea of how a conservator makes a decision about anything. So before they carry out a treatment, they'll be doing lots of tiny tests, they'll make an assessment through trial and error and then make a decision based on all the things they've seen, all the things they can see that happens to the painting and all the knowledge they have in their head from scientific studies. But, it does need the conservator to make the call and different people are going to make different calls. With this particular instance, of how to clean an acrylic painting, I think the research has gone a long way to allay the main fears of conservators, that the worst case scenario of using water, for example, to clean is not really that bad at all, and certainly nowhere near as bad as some of the previous conservation mistakes made with lining paintings or using an inappropriate varnish.

MG: I want to ask the same thing to Alison and Greg. You've both worked with talented painting conservators at your universities and I'm sure they were pigeonholing you and asking you, 'OK, so how do I treat these things, give me some ideas on what I should do.' And how do you respond to that? Greg?

GS: OK. People do ask me for opinions, and I think one of the areas where conservators feel confused is whether water is safe to use, how much can you use, and how long can the contact be? I think that because this is still being hashed out in the science community, we left the conservators who were hoping for some sort of definitive statement a little conflicted about who to believe.

I also sensed that some of the conservators in the audience weren't really sure what a surfactant was or why it's in the paint or what it means if it's removed. We certainly covered that at MPU, and hopefully this conference has educated a larger number of people about the issues that we've identified with acrylics and some of the research that's trying to figure out what's the best practice.

My own personal opinion is that when you have a problem with an acrylic, whether it's optical clarity issues or whether it's an extremely dirty surface, you have to do something. My feeling is that a brief contact with water is not necessarily a bad thing. It certainly can improve optical clarity because the surfactants are water soluble enough that they will come off even with a relatively brief contact with water and swab rolling. We know that their migration to the surface and removal can toughen up the surface of an acrylic film and raise the glass transition temperature slightly… Based on the general trends that we've observed, getting rid of that material should improve the surface quality, make the acrylic harder, perhaps reducing its tendency to pick up dirt.

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Dr. Tom Learner

But, certainly if you're going to remove dirt from the surface, you're going to have to do something to the surface, whether it be an aqueous treatment or a solvent treatment or even a dry treatment, and that's going to affect the surface even if it doesn't remove surfactants. It's at least going to move them around. If you consider only five years ago very little was known at that point and I don't think you could have even had arguments about how you felt the surfaces were affected. No one knew that information. Now at least we pushed that forward and we've got more understanding. I'm sure that in the next five years there'll be even more information gained and hopefully more consensus. But, regardless of what we say, people are treating acrylic paintings and it would be nice to hear more from conservators about what is successful. What types of treatments are successful at doing whatever they were intended to do, whether it's removing dirt or treating some structural problem?

MG: Alison, your group has been working on treatments with water for quite some time. I would imagine that you get engaged in that conversation with conservators about using water and your concerns about what that might mean.

AM: What has been really interesting for me have been my discussions, for example, with the conservation of paintings professor here at Queen's, Barbara Klempan, where I've been able to talk about our results. For example, where our research found that ultramarine blue is more sensitive than, say, titanium white, it has been good to be able to talk to her and find that this is indeed what she's found in her practical conservation work as well.

For me, it's been more a give and take – to listen and to offer what you know. It's been gratifying to know that what we found is also what conservators have found in their conservation practice. The exciting thing about being here at the University is that when students have questions about certain treatments, you can always make the investigation into a research project, which has happened many times.

And it's important for students to see that there are a lot of questions out

there that we don't have answers to, even with the amount of research we've done. We can make better educated guesses but it's still not the absolute. There have been a number of great projects, for example Geneviève Saulnier and Marie-Eve Thibeault's work on dry cleaning methods, and Tracey Klein's census on what problems are found in acrylic paintings and how conservators have treated them. So we've been able to turn it around a little bit and realize that not all the answers are there and that we can't expect that either.

GS: And I had one other thing that I noted at the conference: when we talked about the effect of cleaning treatments on these films, it was never explicitly said that one of the things, that at least I've observed with the custom formulated paints that I've worked with, is the tendency to pick up pigment from the surface and really tackling that major concern of conservators. It's not necessarily a binder issue. It may well be a surfactant-pigment interaction issue where the pigment is solubilized at the surface simply because there's such a load of surfactant present there… I know there's a very high pigment load in these paints. But, is there more to it than that? Is it one of the components of the acrylic that makes pigment loss more likely than for instance in some other formulation or perhaps some other binder system?

TL: Well that hasn't really been looked at in any great detail, no, but I think there are several reasons why pigment particles could be removed during cleaning, including those you just mentioned, and in fact far more likely than the binder being affected per se. You certainly see differences in sensitivity for different colors in the same medium, so it is often definitely color / pigment dependent. I haven't actually cleaned an acrylic painting at Tate for about five years now, but I used to be involved with that side of conservation there. One of the most common scenarios is trying to remove finger marks from acrylic surfaces, and you're absolutely not wanting to see pigment come off on the swabs, you're just trying to get these finger marks out of the paint itself, and often you can do that without any rub off of color. Although there are certainly times where color from a painted surface does comes off on a swab but that's basically one of the main things that conservators would be looking out for when they do their initial testing with different cleaning systems.

And, if a conservator sees color come off in one of these test areas, then they basically stop using that cleaning system and try and find an alternative. I don't think they really think in terms of being able to sacrifice a couple of microns of pigment even if it doesn't affect the final look of the painting. Seeing color come off on a swab just gets the alarm bells ringing. Removing original pigment is one of the big no-no's of conservation, and there's something about removing pigment that is obviously far more disturbing than removing something that's invisible such as a surfactant, even if you know it is possibly being removed too as well as - of course - being original. This is never openly discussed, but I suspect plenty of conservators may well sacrifice a little bit of acrylic gesso along the edge of a painting if there is a visible finger mark that is distracting to the overall image and they really can't find a way to remove it without that sacrifice, as long as there is plenty of gesso beneath it so that you can't see the difference after removing those upper particles. So it undoubtedly does happen, but I think we are some way off in getting conservators to talk openly about that sort of thing, especially in a public setting.

> "AND IT'S IMPORTANT FOR STUDENTS TO SEE THAT THERE ARE A LOT OF QUESTIONS OUT THERE THAT WE DON'T HAVE ANSWERS TO, EVEN WITH THE AMOUNT OF RESEARCH WE'VE DONE."
> *Dr. Alison Murray*

And actually, this does lead me into asking – and this was raised I know at the end of Greg and Jim's paper at the symposium – about whether GOLDEN and other manufacturers should be making a recommendation to artists that it might help us later if artists washed the surface of their paintings once they're dried? And to me, if an artist wants to do that, then it's perfectly fine, although there would presumably always be a risk that they might come across pigment that was susceptible to being pulled off. So, for example, if you have a situation where there is a very deep red color which was slightly susceptible to being removed as the surface is being wiped, then wouldn't you run the risk of getting smears of red color across white areas or other light colors? That would be my only concern with that kind of advice. And how do you deal with the irate artists who came back and said, 'well you just told me to clean this stuff off and this deep red color just smeared all over the white and now I can't get it off'?

MG: Jim, you want to respond to that irate customer? What are your recommendations for artists dealing with either color rub off or protecting their surface or washing with water?

JH: Well unfortunately, it's never a simple matter, as there are always so many factors involved: the thickness of the film, the type and amount of the texture, the gloss of the surface, the degree of dilution, what other mediums or additives may have been used, how well cured is the film, and all the variables that come with the ground and its preparation. Generally speaking, even if the artist had not altered the paint in any way, and the paints were well cured, there is always a good chance you will see some degree of color rub off. I think, as Greg mentioned, it very well may be related to the surfactant that blooms to the surface, thereby increasing the water sensitivity of the surface. That, coupled with the surfactant's affinity for pigment, makes the possibility of removing small amounts of pigment much more likely.

TL: And the high pigment load as well, Jim?

JH: Yes, absolutely, as we maximize the pigment load, this only increases the possibility. In all the tests that we've conducted, the color rub off has been minimal. From the paint

manufacturing viewpoint, the amount of surfactant that would be removed from a typical paint film during a water wash is inconsequential, and should not be of concern. If in discussing this with a client, it appears that the color rub off is in fact extreme, there are most likely other factors involved, and we would engage in a troubleshooting session to come to an understanding of what were the causes of such.

We understand the concerns with putting a removable varnish on top of a paint film that does not have great solvent resistance. We also understand the benefits of having this removable varnish on the surface, to allow for easier removal of dust, dirt, etc. The system approach that we recommend to artists contemplating this issue is to first apply an isolation coat to the painting surface, which is a non-removable acrylic that serves to form a barrier to the impact of any solvents used for any cleaning treatment that may be done either by the artist or the conservator. This isolation coat is basically the non-pigmented acrylic polymers and eliminates the possibility of rubbing any color out when cleaning the surface. The isolation coat also provides a chemically resistant barrier that allows for removal of the sacrificial varnish, i.e. GOLDEN Polymer Varnish, Archival Varnish or Mineral Spirit Acrylic Varnish, minimizing the solvent impact on the painting surface.

MG: Alison, can you respond to what you think might be some of the new… research, either as an outcome of the conference or your own interests?

AM: Obviously, we want to continue working with other conservation scientists, such as Dr. Marion Mecklenburg from the Smithsonian, who specializes in mechanical testing; manufacturers, such as Golden Artist Colors, Inc.; and conservators. We would like to do more research on actual paintings. The building that houses our conservation program at Queen's is attached to the Agnes Etherington Art Centre, which has a collection of modern art. We have already done condition reports for some paintings and in the future we'd like to actually work with them and with the conservators doing actual treatments, using our research results. Also, in our department we have the conservation program, studio art, and art history. So ideally there should be good opportunities to work more with the studio stream, both students and faculty. We've started in these areas, but we hope to do more in the future…

MG: …Greg, in terms of new research, new opportunities, what's being explored at Buffalo State College?

GS: Well, one of the things that I'm focusing on now is to document these changes in the glass transition temperature, and we have some excellent equipment here for measuring Tg, or really any sort of thermal properties through calorimetry. We've observed a five to seven degree change in the Tg with different types of ageing and treatment. And so, then the question becomes, what does that mean – a change in Tg of say 7 degrees? How does that affect the toughness of the surface or the hardness of the surface in a practical sense? We're going to be doing some micro-hardness testing to determine that and also monitor what it means realistically in terms of how these films will pick up dirt? We'll do simulations in a relatively harsh and dirty environment to see what the collection of airborne particles is on the surface. We also want to know what happens to the purported static charge that is said to actually attract dirt to the surface. That's something that was mentioned probably a dozen times in the conference – that these polymer paints are statically charged. Those comments come primarily from anecdotal evidence, and I don't know that anybody has actually tested that. Even if you have multiple people making that comment, the plural of anecdote is not data and nobody has actually shown that these things are statically charged or how statically charged they are. ...that's one aspect of my future work, looking at what these changes mean in terms of how the paint films behave. The other avenue that I'm looking at is more practical. I think I showed one example of how water treatment can actually remove the components, which precipitate this yellowing of the acrylic film. So I'll be looking at a series of mock-ups with isolation coats of various binders and monitor color change with water treatment, without water treatment, with ageing, and with various environmental conditions. If residual components that cause yellowing can be removed by swabbing or sponging early in the life of the painting, artists might like to know that.

"WE UNDERSTAND THE CONCERNS WITH PUTTING A REMOVABLE VARNISH ON TOP OF A PAINT FILM THAT DOES NOT HAVE GREAT SOLVENT RESISTANCE. WE ALSO UNDERSTAND THE BENEFITS OF HAVING THIS REMOVABLE VARNISH ON THE SURFACE..."
Jim Hayes

"...SO I WOULD BE AMAZED IF THE NEXT THREE YEARS DOESN'T RESULT IN SOME FURTHER BIG STEPS FORWARD."
Dr. Tom Learner

MG: I am so grateful for the time that you've afforded us today. This has been really wonderful. Can I ask you for possibly a sum up, whether it be a summary of what was accomplished at the symposium or any other topic you may have to offer up in summary, Tom?

TL: I'm very optimistic. I think we're really on track. Thinking in terms of which new collaborations would be wonderful, of course it would be great if Rohm & Haas opened up and gave us all their information. Unlikely, I know! But I think we're coping without all that and I just think there's a huge amount of interest now in this area, with some really bright people with all the necessary expertise between them that we need, from the pure practical side to

the very scientific side – so I would be amazed if the next three years doesn't result in some further big steps forward. We've heard from Alison, Greg and a bit from me about some of the specific concerns of acrylics that are currently being addressed, but there's also an awful lot of work going on with researching other aspects of modern paints, such as improving methods of analysis and our understanding of their physical properties. It isn't all about acrylic paints and surfactants – although obviously for your readers, Mark, acrylics are probably the most important thing. So, yes, I'm upbeat and I think the research is in great shape. I think that the symposium, certainly for me personally, answered everything I wanted it to answer, and barring any major disasters, I think the momentum will keep us going for many years to come.

GS: Congratulations to Tom on putting together a fantastic symposium. And, one of the things that I wanted to comment on, was how we tried to get together throughout this large project one or two times a year. I found that it was this coming together that was so very important to moving the research forward. Every time we did that, I felt like it was a quantum leap in my understanding of the materials as well as in my enthusiasm for the work. Meeting with Tom, Bronwyn and Michael Shilling gave me the energy to go back and tackle challenges. And, I felt the exact same way with the symposium, I left with a notepad full of ideas for new experiments, to investigate certain phenomena, and to talk to specific people. The lectures were fantastic and they got me thinking…

AM: I couldn't agree more with what everybody said. It was great to be able to talk to the different research groups and see everyone there together at the symposium. I can tell you that all the students that I speak to are really looking forward to hearing what has come out of this symposium. The students I have working with me this summer and the students who are training to be conservators are really excited to learn what's going on and what's possible. I feel there's a lot of movement in the field.

MG: Jim, any last points?

JH: The symposium was definitely an incredibly energetic place to be and a great venue for collaborations, both new and existing. I look forward to continuing our work with these folks on the acrylic paints, to better understand and educate us as formulators, as well as conservation scientists and conservators, to try to really come together and determine best practices of acrylic paint conservation. We will continue working with conservators to determine how to effectively and safely use water for cleaning purposes. We look forward to continuing our refinement of the balance of softness and flexibility, and to work the mechanical engineers into the group to help us determine just how hard is too hard, and what level of flexibility is really integral in the acrylic paint film. In addition, the mechanical engineers can assist us in defining the relative flexibility of the acrylic gessos that might be used for oils, and other media. We will also continue our efforts to bring the manufacturers of the raw materials into this forum, encouraging them to embrace this community, to attend these events, and to participate at whatever level they are able to.

> "THE SYMPOSIUM WAS DEFINITELY AN INCREDIBLY ENERGETIC PLACE TO BE AND A GREAT VENUE FOR COLLABORATIONS, BOTH NEW AND EXISTING."
> *Jim Hayes*

MG: OK, well I… want to thank everyone… for participating, not just in this, but for years of collaborating with us, being able to work together with us and inviting us into the process. We really have enjoyed the conversation and enjoyed the work and look forward to many more of these opportunities together.

So, thank you all.

More about the participants:

Mark Golden

Mark Golden, CEO, has 20+ years of industry experience and was most recently elected to the Board of Directors for New York Foundation for the Arts (NYFA), one of the country's largest providers of funding and services to individual artists. Mark was also chosen to receive one of New York Foundation for the Arts' (NYFA) 2005 Inspiration Awards and was recently honored by the Manufacturers Association of Central New York (MACNY) with a 2005 Wall of Fame Award as well. Mark was the 1996 recipient of the Small Business Person of the Year for New York State award and recognized by President Bill Clinton for his activities in creating a business that exemplifies the spirit of Corporate Citizenship in providing a work environment that values all employees. He has been a guest lecturer at the Smithsonian Institute in Washington, D.C., the Getty Museum in Los Angeles, the Tate Gallery in London and the College Arts Association convention. He has guest lectured in colleges throughout the U.S., Europe and Japan. Furthermore, Mark has co-authored several technical papers on issues dealing with conservation of acrylic paint and paintings.

Jim Hayes

For almost 20 years, Jim Hayes has been the Technical Director for Golden Artist Colors, Inc., a global leader in the manufacture of acrylic paints for professional artists. He received his bachelor of science degree in Chemistry in 1984 from Ithaca College and went on to receive his master of science degree in 1987 in Chemistry at Pennsylvania State University. Hayes, a member of the management team at GOLDEN directs the company's research and development efforts. During his distinguished career at GOLDEN, Hayes has been instrumental in creating most of the new product developments and improvements that now have become essential to the

entire artist materials industry. Additionally, Hayes is responsible for the technical leadership of the GOLDEN Custom Lab, working with individual artists to manufacture unique products to meet their individual needs. He also directs the company's Technical Department that responds to individual customers' questions and concerns.

Hayes has had several works published, including most recently, "Artist Paints – An Overview and Preliminary Studies of Durability," co-authored with Frank Jones, Wenjing Mao, Paul Ziemer, Fei Xiao, and Mark Golden published in *Progress in Organic Coatings* in 2005; and "The Conservation Concerns for Acrylic Emulsion Paints: A Literature Review," co-authored with Elizabeth Jablonski, Tom Learner and Mark Golden published in *Reviews in Conservation* in 2003.

Dr. Tom Learner

Tom Learner is a Senior Conservation Scientist at Tate in London, which houses the UK's national collection of British and international twentieth century art. He received a Master's degree in chemistry from Oxford University in 1988 and a Diploma in the conservation of easel paintings from the Courtauld Institute of Art, University of London in 1991. He then spent a year as a Getty Intern in the painting conservation and scientific research departments at the National Gallery of Art (NGA), Washington, D.C. He joined the conservation department of the Tate Gallery in 1992 in order to assess and establish analytical techniques for the identification and characterization of twentieth century painting materials.

He received his PhD in chemistry (thesis titled 'The Characterization of Acrylic Painting Materials and Implications for Their Use, Conservation and Stability') from Birkbeck College, University of London in 1997. His principal research interests are currently: improving methods of analysis; examining the physical properties of modern paints; assessing the effectiveness of cleaning treatments; study into the materials and techniques of painters in the 1960s and reasons behind their choice; long-term ageing properties of modern paints; and advising artists as to best practice. He has published widely including 2 books: *The Impact of Modern Paints*, co-authored with Jo Crook and published in 2000, and *Analysis of Modern Paints*, published in 2004. Tom was on the organizing and technical committees for the recent Modern Paints Uncovered symposium that was held at Tate Modern on May 16-19 2006.

Dr. Alison Murray

Alison Murray is an Associate Professor in the Art Conservation Program at Queen's University, Kingston, Ontario. She received her honours B.S. in Chemistry from McGill University and her M.S. and Ph.D. degrees in Materials Science and Engineering with a specialization in Conservation Science, from a joint program between the Johns Hopkins University and the Smithsonian Institution. She held a fellowship in the Analytical Research Services Division at the Canadian Conservation Institute and a fellowship from the Samuel H. Kress Foundation to work in the Scientific Department at the National Gallery in London.

Alison Murray is a conservation scientist who is conducting a research program for optimizing cleaning treatments used in the conservation of acrylic paints and grounds; this research integrates information including mechanical testing data, chemical analysis, and surface analysis. Alison Murray's other areas of research and publication include the identification of artists' materials and techniques and the investigation of degradation in art objects using microscopy, non-destructive methods, imaging, and other analytical techniques.

For these different projects, Alison Murray has worked with students from a variety of disciplines including conservation, conservation science, art history, chemistry, engineering physics, mechanical engineering, and chemical engineering.

This research group is very thankful for research and equipment support from the Natural Sciences and Engineering Research Council of Canada (NSERC), the Canadian Foundation for Innovation, the Ontario Research and Development Challenge Fund, Queen's University, and Golden Artist Colors, Inc.

Dr. Greg Smith

Dr. Smith received a B.S. degree from Centre College in anthropology/sociology and chemistry before pursuing graduate work at Duke University, ultimately earning his doctorate in Physical/Analytical Chemistry. His postgraduate training included investigations of pigment degradation processes and palette studies of illuminated manuscripts at the British Library and the V & A Museum, development of synchrotron infrared microscopy facilities at the National Synchrotron Light Source, and researching cleaning issues related to artists' acrylic emulsion paints at the National Gallery of Art. In 2004, Dr. Smith joined the faculty of the conservation training program at Buffalo State College as the first Andrew W. Mellon Assistant Professor of Conservation Science.

Modern Paints Uncovered: *Conversations*

IF YOU ARE INTERESTED IN READING THE COMPLETE TRANSCRIPT YOU CAN FIND IT ON OUR WEB SITE AT WWW.GOLDENPAINTS.COM.

Figure 1: Components of Acrylic Paints

Acrylic Binder	Wetting Agent
Water	Dispersing Agent
Hydrophobic Acrylic Polymer	Thickener/ Rheology Modifier
Emulsifier/ Surfactant	Freeze/Thaw Stabilizer
Adhesion Promoter	Coalescent
Initiator	Biocide
Buffer	pH Buffer
Pigment (possibly surface treated)	Defoamer

artists and conservators alike. Primary among these are the tendency of acrylic dispersion paints to imbibe surface dirt, their propensity to adhere to adjacent surfaces, and the sensitivity of the medium to water and solvents typically used in art conservation.

This paper will explore the relationship between the choices we make as formulators and their relationship to the stability of the work over time for acrylic artwork. Modern synthetic artist colors have been developed by borrowing materials and methods from industrial, automotive and architectural coatings. We have looked to these various industries and the literally thousands of new binders and additives to see if they might help solve some of the seemingly intractable problems for the acrylic paintings. This paper was an attempt to look at the most promising of these solutions for an even more finely tuned balance. Finally, as a Paintmaker and not a conservator, I'd like to share some direction for what we believe will reduce the conservation concerns in the future regarding cleaning the acrylic surface. I know for this part I'll have to have Dr. Smith recused.

Background

Acrylic dispersion paints are a complicated cocktail of additives that in simplest terms attempt to place hydrophobic, or oil loving polymers and often oil loving pigments, into water. (see *Figure 1: Components of Acrylic Paints*). This necessitates at least a binder and an emulsifier (a bridge between the synthetic binder and water). However, to make a paint that can withstand temperature fluctuations, meet market demands for shelf life and safety, and fulfill the artists' demands for versatility and performance – both now and in the future – requires numerous other ingredients. The paint formulator has at their disposal a host of additives to affect drying time, surface finish, rheology, viscosity, texture, and pigment load. Within each class, there are a multitude of commercial products available to perform each task.

Acrylic dispersions are commercially available to cover a range of glass transition temperatures (Tg, the temperature above which the polymer acts as a rubbery and flexible solid, and below which the polymer behaves as a glassy solid). For an artists' quality paint, the ideal flexibility arises from the choice of binder with a Tg slightly below room temperature, such that at room temperature the polymer film is just in its rubbery and flexible phase. However, with such a Tg, a warmer room will yield a soft and tacky surface to these thermoplastic polymer films. When acrylic dispersion paints become overly soft, dust and dirt can readily become imbibed, the paint surface can easily stick to other paints or cover materials (blocking), and fingerprints can become permanently embedded in the surface.

One significant consequence that results from the need for an emulsifier, is that these surfactants remain in the film after drying. The tendency of such surfactant emulsifiers to migrate to surfaces and crystallize has been well documented (*see Footnotes/References 1 & 2)*. In doing such, the crystallized surfactant reduces the clarity of the un-pigmented film, imparting cloudiness (*see Figure 2: the unwashed portion of picture of water washed and unwashed pours from Dr. Smith's portion).* As these surfactants are hydrophilic (water loving) in nature, water is a very effective solvent to remove the surfactant exudates (*see Figure 2: the washed portion of picture of water washed and unwashed pours from Dr. Smith's portion)*.

The effect of washing away the surfactant exudates is not only evidenced by the improvement in dry film clarity, but also in the increased firmness of acrylic paintings, as evidenced by the increase of the measured Tg. In Table 1 (see *Table 1: showing increased* Tg *w/ water soak*), as time of soaking in water is increased, the measured Tg is also shown to increase to approximately 11° C.

Improving Key Physical Properties

As paint manufacturers, we are aware of how current formulation options restrict our ability to deliver quality paints with few or no adverse material properties. Recognizing such, our research and development efforts have been directed toward investigating new additives and materials from the industrial coatings sector, which may address such shortcomings. In the sections that follow, we will share some of our attempts to address these negative consequences we have discussed.

The first attempt at Golden Artist Colors, Inc. to reduce the blocking of our acrylics was to adjust the hardness of the resulting paint. In 1994, acrylic polymer manufacturers phased out the use of ethyl acrylate monomer, replacing it with a more durable butyl acrylate monomer. We took advantage of this change to also increase the Tg's over the entire range of our acrylic line by slightly adjusting the monomer compositions. This reformulation also resulted in less surface tack, and thus an improvement in block resistance.

Over the years we have experimented with a range of different acrylic polymers. Our most significant attempt at this was our joint project with Dr. Frank Jones and colleagues at Eastern Michigan University. The project sponsored by the National Science Foundation allowed us to investigate a wide range of newly formulated acrylics. The premise was that instead of using an acrylic developed for other industries we would start from scratch and develop

Figure 2: Surfactant Exudates - pours of acrylic disperson polymer. Right: untreated pour; Left: pour washed/soaked with water. After 2 weeks of drying, this pour was soaked in water for 10 minutes, then dried.

an acrylic specifically made for artist materials. We recognized that as a result of industrial requirements, ingredients may be chosen more for economy, or unique requirements, than for optimum durability. While our testing proved we could improve water resistance, it was at the loss of significant color acceptance and clarity, and thus was unsuccessful.

Another approach was to evaluate alternative polymer chemistries. While 100% acrylics are widely recognized in the coatings industry as having excellent weathering and UV resistance, they are not necessarily the best regarding film toughness and water resistance. We have evaluated various polymers, including polyurethane dispersions and silicones, known for their high degrees of film toughness and water resistance. Also, polymers capable of self cross linking, are also commonly used in industry to reduce blocking and increase water resistance. Unfortunately again, we saw either minimal improvements in the key properties, excessive loss of color acceptance, or that the polymer itself resulted in a strong yellow quality.

The use of functional pigments and additives is yet another mechanism for improving block resistance and water resistance in the coatings industry. Waxes, including synthetic (polyethylene, polypropylene, polyamide, etc.) and naturally occurring (carnauba), generally resulted in significant yellowness of the film.

Polytetrafluoroethylene solids are well known for their low surface energy and high level of slip; they are the stuff of Teflon® coatings. While these additives generally increased the slip of the surface, they did not offer substantial improvements in the reduction of blocking and water sensitivity.

As acrylic paint surfaces seem to readily attract and imbibe dust and dirt, we investigated whether a truly static attraction was involved. We formulated paints with a conductive pigment, a mica based pigment with a surface layer of tin oxide doped with antimony to become a semi-conductor. The results indicated that the acrylic paints do not carry any significant static charge, as there were no differences in dust build up with or without the conductive pigment.

Recognizing that a matte or rougher surface should suffer less from blocking and tack we experimented with matting solids to reduce the film softness. Here we saw a dramatic reduction in the surface tack and improvement in the block resistance. The significant problems with these materials were the loss of clarity when made into matte, as well as potential yellowing that results from some of the most successful matte materials (especially noticeable in Gels and Mediums). Matte lines of paint also have a reduced level of color brilliance, and suffer from problems of marring and permeability.

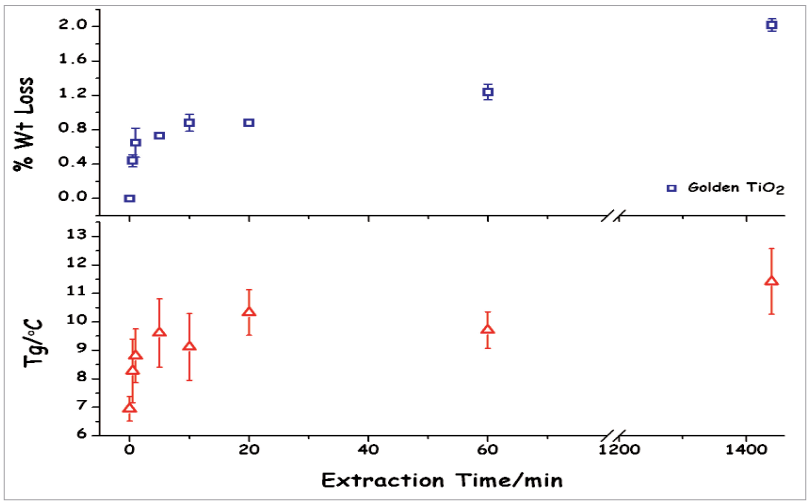

Table I

Reducing Surfactant Migration

As mentioned previously, the surfactants in the system do not in fact stay homogenously dispersed throughout the film after drying, and instead they develop areas of higher concentrations near each interface; the film/substrate interface, as well as the film/air interface. This surfactant migration to the film surface in fact, adds to the water sensitivity of the paint film by increasing the hydrophilic nature (water-loving) of the surface, as well as having the effect of lowering the Tg and thus softening of the paint surface, via hydroplasticization.

There are several ways we've investigated to mitigate surfactant release from the acrylic that will be discussed below.

While reducing the level of surfactant may seem like the most straightforward approach, remember the balance. One of the prime areas of concern is stability. Shelf life stability and freeze/thaw stability are related to the surfactant type, effectiveness and amount. A paint that does not last well in the studio, or congeals after a freeze/thaw cycle, would not be commercially acceptable.

In actuality, the majority of the surfactant that is present in a system is already in the neat polymer dispersion received from the polymer manufacturer.

Without these surfactants, the polymer solids would not remain dispersed and homogenous. We have investigated surfactant free polymers. However, the polymers tested did not show an increase in water resistance.

We found only one surfactant on the market that claims to be volatile and thus leaves the paint film. Unfortunately this one was not suitable, as it had poor pigment wetting properties, and it had an incredibly strong odor, so, we abandoned our investigations.

While there are many research papers discussing the benefits of having a surfactant that reacts with the polymer to form a permanent bond, the reality is that there are few in the market and they are incredibly expensive. As a result, polymer manufacturers are reluctant to use them, limiting our ability to even experiment.

Tools for the Artist

Now that we understand there is a relative softness to the acrylic films, and that the surfactant in most non-matte films only adds to this softness as well as the water sensitivity, why not simply wash it off once the painting is complete?

Through our own research here at Golden Artist Colors, Inc., as well as the work of the conservation community, it is apparent that the surfactant at the surface is not beneficial, and is readily removed in water. As a result, we feel strongly that the impact of washing a paint surface with a damp, lint-free white cloth, will only improve the physical properties of the painting, and thus improve its ability to withstand the test of time.

The next question then focuses on the "how-tos". Listed below are guidelines to be thought of in determining the best potential process for each artwork:

What tools should I use?

A soft, low or no linting cloth is ideal. We have found that 50/50 white cotton/polyester T-shirt material works quite well. Also, use distilled water purchased from grocery or drug stores, as

this will eliminate concerns from the quality of the water you have in your studio. One key is to rinse the cloth regularly to eliminate the surfactant that it has absorbed.

When should I wash?

A bit tougher question! Generally, the surfactant takes 2-4 weeks to build up at the surface. It would be most ideal to wait for this 4 week period, to not only maximize the amount of surfactant at the surface, but to be sure the paint films are well cured.

How do I know I have done a sufficient job?

First, realize that simply by doing it, you are improving the properties of the surface. Note that surfactants are in fact soap-like materials, and generate foam when in contact with the water. Hence, you can continue gently washing the surface with clean water and cloth until there is no sign of sudsing. Also, once dry, the film should appear uniform, and non-blotchy. If blotchy areas persist, continue washing to remove the remaining surfactants that are most likely the cause of the non-uniform appearance.

Will the surfactant return?

Unfortunately, as long as there is surfactant in the film, it will continue to migrate to the interfaces. By either cleaning too early in the process (especially if cleaned within a few days of drying), or by cleaning without water, the bulk of the surfactant will still be present and eventually move to the surface. If cleaned well, meaning waiting the 4 weeks and repeating the process until no sudsing is evident, even then there will be more surfactant that can and will come to the surface, but it should be minimal.

Does a stain painting get treated just as a thick impasto piece?

This is probably the toughest, or at least most complicated question! Generally the answer is NO. A true stain painting in which the acrylic paints have been diluted substantially with water (typically a stain contains less than 10% paint) should NOT need to be washed, as the paint, along with the surfactants, has soaked into the canvas or absorbent ground material and is therefore, not on the surface. If there is a true paint film on the substrate, then it is best to go through this water washing process. Thinner paint films obviously require a more delicate and softhanded approach. Highly textured areas require not only a gentle hand to keep from altering the texture, but also a deft hand to attempt to get into each nook and cranny.

Will color rub off?

Yes, most certainly, to some extent. Ideally, there would be no such color extracted with the wet cloth, but the reality is that some colors bleed more than others, but all should be fairly minimal. As you "wash" the surface with the damp rag, be cautious and use **as little pressure as possible**. Small amounts of color soaked into the cloth should not be a concern. If there are concerns about one color streaking into another, such as with a hard edge between colors, then try to keep your wiping motions within a color passage.

While washing the surface in fact improves the properties of the acrylic painting, there are additional protective steps that are recommended to insure maximum protection, as well as the best chance of successful cleaning at some later date. The application of one of GOLDEN's varnishes (Polymer Varnish, MSA Varnish or Archival Varnish) will create a surface that is harder than that of the paints, thus less receptive to the retention of dust and dirt. The varnish is also chemically reversible, and thus can be readily removed with the appropriate solvents *(see footnote about varnishes with web links)*, thus removing the dust or dirt with it. To effectively and safely allow for varnish removal without impacting the paint film, it is advised to first apply an isolation coat. This isolation coat acts as a physical barrier between the paint surface and the varnish, thus eliminating any potential for solvent attacking the painting during varnish removal. While the processes involved in such will not be discussed here, there is extensive information on our Web site (www.goldenpaints.com) regarding such.

Summary

We just returned from the *Modern Paints Uncovered* symposium, held in London at Tate Modern, where we presented this information. We were delighted with the collaborations of paint manufacturers, curators, conservators and conservation scientists, all working together to understand these modern materials. Out of this should come a much better understanding of the conservation implications the materials carry, as well as some much needed progress in defining acceptable conservation treatments.

The real significance of all this work and collaboration to evaluate what is happening with the acrylics as they are ageing, is that now after 50 years of being in the field, they simply are doing very well. Paintings made with these paints are not falling apart, nor showing any signs of significant deterioration. That said, they do in fact present new challenges to conservators who are now responsible for their care. The chemical and water sensitivities are really the key factors, as the conservator is not yet comfortable with what to use and how to clean an acrylic painting.

Pictured left to right: Dr. Greg Smith and Jim Hayes collaborate on research that was conducted for the recent Modern Paints Uncovered Symposium at Tate Modern in London.

For those artists who are truly serious about the longevity of their work, there are tools and techniques available to preserve better the work. The washing of the surface should prove a significant step in reducing the negative consequences of surfactant migration. The application of an isolation coat and removable varnish are critical degrees of protection that insure the artwork has a greater chance to withstand the test of time.

We will continue to work on addressing these issues of softness and water sensitivity of the acrylic films, working with you the artist, as well as the conservation community to define better all the underlying factors that influence the key attributes of this medium. We will continue to investigate new materials and new formulations, but we all must remember: the "Question of Balance": – every change is inter-related, and one cannot make a change without understanding first, the impact on the entire system.

Footnotes/References:

1. Digney-Peer, S. et al.
"The Migration of Surfactants in Acrylic Emulsion Paint Films"
Modern Art, New Museums. IIC: Bilbao, 2004, pp 202-207.
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Golden Foundation Honors Five Artists Working in Paint

The Sam and Adele Golden Foundation for the Arts, Inc. was founded by family members in 1997 for the charitable purpose of fostering innovative artistic expression and the creative process. It is one of the few foundations in the country to focus exclusively on individual professional artists working in paint. In its continuing effort to become a significant contributor to the artist's support system, the Foundation recently identified five artists to be recognized with an individual artist award.

Mark Golden, president of the Golden Foundation stated, "There is a need, now more than ever to support the work of professional artists and to provide the incentive for these artists to create new work."

The award provides a one-year grant, up to $3,500 to assist artists in the advancement of their career. This year's recipients included **James Barsness, Theresa Chong, Joey Fauerso, Juri Morioka, and Danielle Tegeder.** An independent selection committee chose these artists from hundreds of career professionals who applied. The jurors were Mary Murray, curator of Contemporary Art at Munson Williams Proctor Arts Institute in Utica, NY; Andrea Inselmann, Curator of Modern and Contemporary Art, Herbert F. Johnson Museum of Art, Cornell University, Ithaca, NY; and Contemporary Artist Frank Owen, Art Department, University of Vermont.

James Barsness resides in Athens, GA. He received his MFA from the San Francisco Art Institute in 1988. His first large scale survey show entitled "Mythic Inventions" was at the Boise Museum of Art in Idaho and a second large survey exhibit was held at The Contemporary Art Center in Atlanta, GA in 2003. His work is included in a number of important group shows and in the collections of the Goldberg Foundation, NY, The Whitney Museum of American Art and Yale School of Art, CT.

Theresa Chong attended Boston University School of Fine Arts with a Dean's Scholarship in painting where she received a BFA. In 1991 she received an MFA in painting at the School of Visual Arts in New York City. Her work has been reviewed in The New Yorker, The New York Times and Art in America. Her paintings are included in the collections of The Museum of Fine Arts, Houston, TX, The Whitney Museum of American Art, The Fogg Art Museum at Harvard University and several corporations. Theresa is a mid career artist who is striving to have her work recognized by a larger audience.

Joey Fauerso lives in Roswell, NM. She received her BFA with honors from the University of Iowa in 1998 and MFA in 2001 from the University of Wisconsin where she was nominated for the prestigious Dedalus Foundation Grant. After graduation she returned to San Antonio where she is the founder/director of The Bower - an artist run, non-profit exhibition space. Her work has been included in several group shows including a show of four artists at Parson's University-Paris and *Blue Star 18* at the Blue Star Contemporary Art Center in San Antonio. She had a solo exhibition at Finesilver Gallery in 2004 and in 2005 received the ArtPace Travel Grant, The Dallas Museum of Art Kimberough Grant and a Ucross Residency Fellowship. As a painter, Joey is committed to the continued exploration of the medium and its creative capacities.

Juri Morioka is a Tokyo born painter, living in New York City. She received her BFA in Painting from Parsons School of Design in 1990. Two recent Fellowship Residencies from the Vermont Studio Center and a chashama artist-in-residence subsidized studio space grant in NYC have provided her time to create new work. She has had four solo shows in Tokyo, including two at Banco Gallery in Ginza. Group shows in New York City include Edward Thorp, Sideshow and The Andy Warhol Museum. In addition, her work is included in numerous private and corporate collections such as SONY. Her paintings will soon be on display at the Jan Jar in Dubai, and in the United Arab Emirates.

Danielle Tegeder currently resides in Brooklyn, NY. She has an MFA from The School of Art Institute of Chicago and a BFA from SUNY Purchase. Several exhibitions include The New Museum of Contemporary Art, Bronx Museum of Art, Brooklyn Museum, Triple Candie and Ace Gallery in New York, Mixture Gallery in Houston and The Henry Gallery in Seattle, WA. Internationally she has shown at the Muller-Dechiara in Berlin, Germany and the Anne de Villepoix Gallery in Paris. Recent reviews include the New York Times, ArtForum, Art in America, and NY Arts. She received grants and residencies from Yaddo, The Fullbright Foundation, ArtOmi, and The National Studio Program at PS 1/MOMA Studio Fellowship. She is artist in residence at the Smack Mello Studio in Brooklyn and teaches and mentors art students at SUNY Purchase. Her artwork is mostly large brightly colored abstract paintings inspired by underground architectural plans.

In addition to supporting individual artists, The Sam and Adele Golden Foundation for the Arts, Inc. awards grants to cultural organizations. This year the foundation is accepting applications from cultural organizations who have received their 501 (c) 3 IRS designation and whose primary purpose is to promote and support visual artists working in paint. A full listing of grant awards, the application and examples of the award recipient's artwork is available on the Web site: www.goldenfoundation.org.

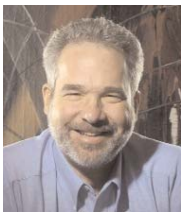
GOLDEN Answers Artists' Requests for Traditional Palette

Six New Historical Fluid Acrylic Colors Introduced

As a direct result of requests from the art community, we have added six new colors to our existing Fluid Acrylic product line to include a selection of historical colors previously offered only in the Heavy Body formula. Recognizing the need for these significant colors for artists working in the highly versatile Fluid line, GOLDEN has also created greater opportunity for watercolor artists. Introducing these Historical Colors complements the color spectrum previously existing in Fluids, as well as increases options for artists already familiar with these colors in the Heavy Body Acrylic formula. Because Fluids flow smoothly and evenly from the brush and can be poured, puddled, drizzled or dropped onto the canvas, artists can push the limits of their creativity and expand the boundaries of acrylic painting. The Fluid Acrylic line extension will feature the following six colors and will be available in all six Fluid Acrylic sizes: 1 oz., 4 oz., 8 oz., 16 oz., 32 oz., and 128 oz.

- *Fluid Naples Yellow Hue*
- *Fluid Manganese Blue Hue*
- *Fluid Indian Yellow Hue*
- *Fluid Prussian Blue Hue*
- *Fluid Alizarin Crimson Hue*
- *Fluid Sap Green Hue*

American Institute for Conservation of Historic and Artistic Works Recognizes Mark Golden



Mark Golden, CEO of Golden Artist Colors, Inc. was recently selected by AIC to receive an Allied Professionals Special Recognition Certificate, which is a newly established award category this year. AIC created the award in order to acknowledge the work of colleagues in allied professions with whom it works closely to solve problems, transfer technology and set standards.

AIC is the national membership organization of conservation professionals dedicated to preserving the art and historic artifacts of our cultural heritage for future generations. Providing a forum for the exchange of ideas on conservation, AIC advances the practice and promotes the importance of the preservation of cultural property by coordinating the exchange of knowledge, research and publications.

The award was announced at the Business Meeting during AIC's Annual Meeting in Providence, R.I. on Sun., June 18. Also receiving the award was John Johnston, innovator in the pressure sensitive tape field.

SPECIAL CONSERVATION ISSUE

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