western association
waac
for art conservation
Newsletter

May 2005 Volume 27 Number 2

President's Letter

Beverly Perkins

"*I have wandered over a good part of the Territories and have seen much of the varied scenery of the Far West, but that of the Yellowstone retains its hold upon my imagination with a vividness as of yesterday…*"
Thomas Moran

Drawn to Yellowstone: Artists in America's First National Park will be on exhibit during the annual WAAC meeting at the Buffalo Bill Historical Center on August 27 – 29.

Seemingly a place apart from civilization, Yellowstone's exotic appeal has lured generations of artist and by the 1890s was known as "the Nation's Art Gallery." Peter Hassrick, former Director of the BBHC and organizer of the Yellowstone exhibition will be the opening speaker for the WAAC conference.

Contents

Many interesting speakers and talks have been proposed for the conference. Glenn Wharton and Curator Sarah Boehme will be presenting their work on the wax sculpture models of Charles Russell. William Adair will be presenting his work on the frames of Charles Russell. John Kjelland will present a treatment of a 1906 Mill's Verbal Fortune Teller. And many more fascinating talks are in the works.

Presenting a talk – There is still plenty of time to contact us with your idea for a talk or poster. We have only begun to collect presenter information. Please contact: Beverly Perkins, WAAC President, at 951-698-1520 or Perkinsb@comcast.net. Speakers will be contacted for bios and abstracts.

Travel to Cody is easier that it might seem (comparable to getting to Sante Fe). Yellowstone Regional Airport is located just two minutes from downtown Cody and 52 miles from the east gate of Yellowstone National Park. Cody is served by Delta and United commuter connections. Billings, Montana is the closest airport that accommodates full-sized jets and is only a beautiful two hour drive from Cody. Rental cars are available at the Billings and Cody airports. See page 2 for information on shuttles and taxis.

Recent airfares seem to run around $275 to $325 from California, Colorado, or Utah to Billings or Cody. Once in Cody the going is pretty cheap. We were amazed to find that dinner for five was about the same price as dinner for one in New York.

Accomodation in Cody varies a great deal. Information on all sorts of motels and camp sites can be found at www.codywyomingnet.comand and www.codychamber.org. Cody is extremely popular in the summer so consider booking space soon. See pages 2 and 3 for suggestions.

Silent Auction – Robert Gamblin has donated a set of Conservation Colors to the auction (the chance to bid on this set of paints is a good reason to attend the meeting). Please consider bringing an auction item to the meeting. It doesn't have to be expensive or new, just interesting and desirable. If you prefer to mail an item please send it to: Sarah Boehme, Curator, Whitney Gallery of Western Art, Buffalo Bill Historical Center, 720 Sheridan Ave., Cody, WY 82414. No chemicals please. The auction proceeds will create a fund for the maintenance of the outdoor sculpture being collected by the BBHC.

Activities abound for children, shoppers, hikers, bikers, and all the rest. The opening night reception will be held at the beautiful Simpson Gallagher Art Gallery in town. The "banquet" will be held outdoors at the Pow Wow Grounds and includes western swing dance lessons. It is your choice; enjoy dancing or enjoy watching.

I was always looking forward to being in Wyoming with WAAC members. The town of Cody, the museum, Simpson Gallagher Art Gallery, and the outdoor banquet with dance lessons just sound like too much fun. Now with prospective talks and speakers coming forward, I am really looking forward to the conference itself. We hope you will join us in Cody this August.

Travel Guide to Cody, Wyoming

GETTING TO CODY

By Air: The Yellowstone Regional Airport is the year-round aviation gateway to Yellowstone National Park and Northwest Wyoming. The Airport is located just two minutes from downtown Cody, approximately 52 miles from the east gate of Yellowstone National Park. Cody is served by a Delta Connection operated by SkyWest Airlines through Salt Lake City and by United Express and Mesa Airlines through Denver International Airport. Billings, Montana is the closest airport that accommodates full sized jets. Billings is a beautiful two hour drive from Cody.

By Car: Cody is located in the northwest quadrant of Wyoming, 52 miles east of Yellowstone Park. The town is positioned at the intersection of US Highways 14-16-20 and WYO Highway 120. Rental cars are available at the Billings and Cody airports.

Taxis and Shuttle: This is a quote from the Cody website. "Cody offers easy and immediate transportation from taxi companies. Phone books, lodging properties, or your bartender will easily connect you to a safe and responsible mode of transportation."

Phidippides Shuttle Service 866-527-6789 phidippides@codyshuttle.com

Shuttle Services 307-899-3960 codyshuttleservices@yahoo.com

Powder River Transportation: Bus lines connecting Cody to Billings and Denver. 800-442-3682

STAYING IN CODY

Motels:

AmericInn - nice, new motel about a 10 minute walk to the museum
307-587-7716

Best Western Sunset Motor Inn - recently remodeled, about a 2 minute walk to the museum
307-587-4265 or 1-800-WESTERN

The Irma - the historic hotel in town has about 5 unique rooms, and the rest are cinderblock. It is about a 5 minute walk from the museum.
800-745-4762

Super 8 - fairly new building up by the airport is about a 5 minute drive from the museum
307-527-6214

Holiday Inn - may have remodeled rooms, a good 15 minute walk through town to the museum
800-527-5544

Days Inn - fairly new with a Southwest theme (in Wyoming? oh well)
307-527-6606

There are many more motels in Cody and probably cheaper than the ones listed above. Just go to www.codywyomingnet.com.

Campsites:

Ponderosa Campground- you need it, they got it! Full hookups, pull thrus, tent sites, and even Tipis to stay in! Only a 3 minute walk to the museum
307-587-9203

Volume 27 Number 2

WAAC Newsletter

WAAC Newsletter (ISSN 1052-0066) is a publication of the nonprofit Western Association for Art Conservation (WAAC). It is published three times per year, in January, May, and September. WAAC Newsletter is printed on alkaline paper.

EDITOR

Carolyn Tallent

REGIONAL NEWS

Laura Downey Staneff

TECHNICAL EXCHANGE

Albrecht Gumlich

HEALTH & SAFETY

Chris Stavroudis

ARTICLES YOU MAY HAVE MISSED

Susanne Friend

COPY EDITOR

Wendy Partridge

Photocopying

To make academic course packets that include articles from WAAC Newsletter, contact the authors of the articles directly.

Note to Authors

Authors of articles and other contributions accepted for publication in WAAC Newsletter assign to WAAC Newsletter the right to publish their work in both print and electronic form and to archive it and make it permanently retrievable electronically. Authors retain copyright, however, and may republish their work in any way they wish.

Disclaimer

The Western Association for Art Conservation does not recommend particular individuals, businesses, treatments, products, or services. WAAC Newsletter is simply a vehicle for the presentation of information from various sources. Publication of articles or reports in the Newsletter should not be construed as an endorsement of their content by WAAC. Opinions expressed in articles published in the Newsletter are those of the authors.

Deadline

Contributions for the *September* Newsletter should be received by the Editor before **July 30 , 2005**.

Western Association for Art Conservation

The Western Association for Art Conservation (formerly, the Western Association of Art Conservators), also known as **WAAC**, was founded in 1974 to bring together conservators practicing in the western United States to exchange ideas, information, and regional news, and to discuss national and international matters of common interest.

Individual Membership in WAAC costs $30 per year ($35 Canada, $40 overseas) and entitles the member to receive the WAAC Newsletter and the annual Membership Directory, attend the Annual Meeting, vote in elections, and stand for office. Institutional Membership costs $35 per year ($40 Canada, $45 overseas) and entitles the institution to receive the WAAC Newsletter and Membership Directory. For membership or subscription, contact the Secretary.

Internet

Articles and most columns from past issues of WAAC Newsletter are available on-line at the WAAC Website, a part of CoOL (Conservation OnLine) hosted by Stanford University Libraries, at http://palimpsest.stanford.edu/waac/.

WAAC Annual Meeting August 27 - 29

Cody KOA- up by the airport, a 5 minute drive to the museum
307-587-2369

DINING IN CODY

There is a variety of dining experiences awaiting you in Cody.

The Irma - it is worth seeing the historic bar and some of the historic locals at breakfast in the dining room of the hotel. Some of the less historic locals drink at the new bar after work.

Maxwell's - one block from the front door of the museum. Good food, very consistent and lots of variety

Bubba's BBQ - right outside of the AmericInn. Big tasty BBQ- no frills, lots of sauce

LINE DANCING AND DRINKING and unfortunately, smoking too, at Cassie's out on the West Strip going towards Yellowstone.

Silver Dollar Bar - downtown, no line dancing (don't even think about it!) but drinks and pool tables.

COFFEE

Little drive through coffee huts at both ends of town. The coffee hangout in town is BETA on 12th street.

DUDE RANCHES OUTSIDE OF CODY

(These are too far to commute in for the meeting but make a great pre-conference experience)

7D Ranch in Sunlight - 307-587-9885, ranch7d@wyoming.com

Rocking D River Ranch in Wapiti - 307-587-8329, the rockingd@wyoming.com

There are many, many more dude ranches in the area.

LODGING IN YELLOWSTONE AND THE GRAND TETONS

Book early for these sites. Everything from basic cabins, camp sites, and regal lodges are available. Old Faithful Inn is not to be missed even if you just stop in for an ice cream cone.

If you can't book early, we have had pretty good luck just checking in with the front desk for cancellations.

Membership

Chris Stavroudis
membership secretary

WAAC welcomes the following new members. New member information will be printed in the 2005 WAAC *Membership Directory,* and the new members are listed here by name only.

Stefanie Becker; Carnegie Museum of Art; Denyl Cloughly; Yoonjo Lee; Erin Kelly; Gordon Lewis; Vanessa Muros; National Park Service - Harpers Ferry Center; Caitlin O'Grady; Rose M. Rachal; Stephanie Ricke; Riegler & Son's; Bonnie Rimer; Elise Yvonne Rousseau; David Spillman; and Kristen St.John.

Regional News

WAAC welcomes a new Region for this column: Alaska now boasts several in-state conservators and has its own reporter, Scott Carrlee. (Previously, of course, Alaska's news was reported under the Pacific Northwest region.) Welcome, Alaskans!

ALASKA

Monica Shah has finished a huge commission to clean several large tapestries at the Anchorage International Airport. Monica is still working on contract at the Museum of the North on their move into new storage. In May, she will be co-presenting a paper about the move, at the Canadian Association for Conservation annual meeting in Jasper, Alberta with **Angela Linn**, Collections Manager for Ethnology and History.

Emily Ramos is moving into a new space in Anchorage where she will have more room to set up a book and paper conservation studio. **Sean Charrette** has left the Museum of the Aleutians for greener (and warmer) pastures in Cambodia. We wish him well.

Ellen Carrlee is currently working on a huge wooden fish trap that was excavated about 10 years ago from a riverbank near Juneau. The 700-year-old fish trap was originally used by the Tlingit tribe to catch salmon and other fish. The trap, made from hemlock staves lashed with spruce root, survived burial waterlogged and sealed in mud. It was treated with PEG upon excavation and is now being readied for mounting and display at the Juneau Douglas City Museum.

Scott Carrlee recently finished the treatment of a wooden propeller that will go on display at the Juneau Airport. The prop was used on one of the earliest seaplanes to be used in Alaska, a Boeing B314 Flying Boat. In March, Scott gave a 2-day workshop on artifact handling at the Alaska Native Heritage Center in Anchorage.

Regional Reporter:
Scott Carrlee

ARIZONA

Nancy Odegaard and **Teresa Moreno** taught IPM and Soft Packing for the BACC collection care workshops held in Tucson and San Diego. Nancy developed a 2-day workshop on Pesticide Residues and Testing with the Ely Shoshone Tribe of Nevada that was held at UNLV in Las Vegas in coordination with **Vicki Cassman**. A new book on the topic, *Old Poisons, New Problems* is now available from AltaMira Press.

Peggi Cross is working with **Julie Unruh** on adhesive testing and identification using FTIR.

Maggie Kipling offered a day of Introduction to Art Conservation for multiple sessions of high school chemistry students in the Phoenix area.

Melissa Huber received a NEA Seminar Scholarship to attend a 3-day National Preservation Institute Seminar in Phoenix on Maintenance in Historic Structures.

Nanette Skov is planning to go to Peru again in June. Anyone wanting to go along can contact her at nanett eskov@hotmail.com by the first of May.

The Heard Museum in Phoenix is re-installing their permanent exhibit galleries scheduled to open in May 2005. **Martha Winslow Grimm** is responsible for not only treating textiles for the exhibit but also preparing and dressing the mannequins being used in the display.

Gretchen Voeks and **Brynn Bender** ventured to the Grand Tetons National Park in March to pack half of the Vernon Collection of Native American objects for transport to the Western Archeological and Conservation labs. The collection will be examined for treatment needs, treated, and stored at WACC for 5-7 years while Grand Tetons rehabilitates storage and exhibits.

Brynn continues to work on the treatment of historic river boats at the Grand Canyon. She is currently being assisted by conservation assistant **Audrey Harrison**, and pre-program interns **Tara Hornung** and conservator **Caitlin O'Grady**. Pre-program interns Tara Hornung and **Angela Brock**, and contractor **Maria Lee** are assisting Gretchen with the conservation of tinware lamps and chandeliers from the Painted Desert Inn at Petrified Forest National Park.

Regional Reporter:
Gretchen Voeks

HAWAI'I

A flash flood on October 30, 2004 destroyed the ground floor of Hamilton Library at the University of Hawaii. **Lynn Ann Davis** was up to her ankles in mud working with the Library staff and volunteers to retrieve valuable maps and aerial photographs of Hawaii and the Pacific region. All of these priority collections were stabilized by freezing, and the slow process of treatment continues.

Downey Manoukian (the only paper conservator in Hawaii) responded to an early morning plea for help and worked on over 30 encapsulated maps in the Preservation lab on the 5th floor until it got too dark to work (there was no electricity in the building). The ongoing stress of dealing with disaster recovery has been mitigated by friends and colleagues. **Linda Hee** kidnapped Lynn and took her out of the mud for lunch at the Kahala Mandarin Hotel. **Susan Sayre Batton** has insisted on kayak therapy when she is in town working on the Honolulu Academy of Arts collection.

Susan Sayre Batton has been working in Kyoto on the initial research and organization of the Richard Lane Collection, acquired in 2004 by the Honolulu Academy of Arts. Lane was a world-renowned scholar of *ukiyo-e*, who published over 300 studies on Japanese art and literature. Academy Director **Stephen Little** purchased the contents of Lane's home, including his art collection, computers, files, and library. The Honolulu Academy of Art acquired over 10,000 Japanese and Chinese paintings, over 7000 Japanese illustrated books from the early Edo (pre-1700) period, several thousand ukiyo-e prints, and a significant collection of *shunga,* or erotic printed books, prints, and paintings. Some highlights of the collection were published in the Spring 2005 issue of *Orientations* in an article by Stephen Little.

Larry and Rie Pace worked on a large 1950's Dubuffet painting belonging to a local private collection which was damaged in transit from New York. A large oil painting, which is suspected to be by an Italian Renaissance artist, was taken to the Queen's Hospital Imaging Department to be X-rayed. The hospital staff were almost as excited about X-raying the painting as they were about having recently X-rayed a large perky penguin from the local sea park. The painting apparently lacked the penguin's personality and fish-breath.

In addition the Paces are conducting condition and conservation surveys of the panel paintings currently on exhibit in the European Galleries at the Honolulu Academy of Arts and paintings by Hawaiian artist Edward Bailey (1814-1903) in the collection of the Bailey House Museum on Maui. They will be traveling to Japan again this year in April to give talks at Musashino Art University in Tokyo.

Dawne Steele Pullman has finished her year of living and working in SE Asia and enjoyed it immensely. She managed to visit several countries and treat many paintings by artists from the Philippines, Indonesia, Hong Kong, Pakistan, Vietnam, and even China, while based in Singapore! She is now back to her gypsy life as a free-lance conservator working in the USA.

Regional Reporter:
Lynn Ann Davis

GREATER LOS ANGELES

Last February**,** LACMA's Director of Conservation **Victoria Blyth-Hill** traveled to New York, where she gave a lecture at the Institute of Fine Arts at NYU and toured the Tim Hawkinson retrospective at the Whitney, which is scheduled to come to LACMA in June 2005. While in New York, Victoria also had an opportunity to visit Christo's *Gates* in Central Park.

Mellon Fellow **Yadin Larochette** will be giving a talk at this year's AIC Textile Specialty Group on her experiences during her final year in the Winterthur/University of Delaware Program in Art Conservation. During that time in 2003-2004, she interned at four institutions in Europe and North and South America. The institutions included the National Museums of Scotland in Edinburgh; the Fashion and Textile Museum and the National Museum of History in Santiago, Chile; and at the Los Angeles County Museum of Art. This paper, titled "Conservation Training on Three Continents: Exposure to Different Documentation Approaches," presents an international perspective, covering the global trend towards digital collections management systems and four approaches to the documentation of costume and textile collections.

Objects conservators at LACMA are working on a lot of projects in preparation for the opening of the Broad Contemporary Art Museum scheduled for 2007, also in advance of the opening of new Centers for Art at the museum. As of July 1st**, Natasha Cochran** will become Assistant Conservator in the Objects lab at LACMA.

Jennifer Koerner, Soko Furuhata, Chail Norton, and **Chie Ito** have spent the last few months working on 167 posters from the permanent collection in preparation for the *Rauschenberg: Posters* and *German and Austrian Posters-War, Revolution, Protest* exhibitions, which opened March 10.

In March, Chail Norton helped **Yosi Pozeilov** present the second "Digital Photography 101 for Conservators" workshop in Atlanta, Georgia. Also in March, Chie Ito went on her first courier trip to Washington DC, where she also met with conservators from several museums about her staining research on a selection of Yoshitoshi prints.

Last February, **Maria Cristina Graça** arrived from Rio de Janeiro to begin a ten-month fellowship in paintings conservation at LACMA, with funds generously provided by the Lampadia Foundation. Cristina has been a practicing conservator and conservation teacher in Rio for over twenty years. She is working on a variety of projects during her fellowship, including a portrait by George Romney.

Rosamond Westmoreland, Joe Fronek, and **Susan Sayre Batton** have completed the technical examinations for the forthcoming Norton Simon Museum's *19th Century European Art Catalog*, published by Yale University Press. The paintings in the collection were studied by Roz and Joe, while Susan examined the works on paper. Working along with scholars Richard Kendal, Stephen Eisenman, and Rick Brettell, the team examined and researched over 120 works of art in a project that took three years.

Elisabeth Schlegel accepted a new position at the collection Essl in Vienna at the beginning of the year. She is happy and quite busy, working with exhibitions as well as the permanent collection, which is focused on modern and contemporary post-war art. Elisabeth continues her private work, currently she is involved in the restoration of a huge altarpiece for the National Institute of Conservation. In addition to these activities, Elisabeth gave a presentation on the use of the ultrasonic humidifier for the consolidation of the surfaces of modern paintings at the Museum of Modern Art Vienna.

The Natural History Museum of LA County is pleased to welcome **Susie Seborg**, a second year Buffalo conservation student, as a summer intern funded by the Samuel H. Kress Foundation. Susie will work with NHMLAC conservator **Tania Collas** on stabilization treatments, exhibition preparations, and other collections care projects in the History, Mammalogy, and Mineralogy collections. Tania recently completed preparations for the display of a suit of Tokugawa Period Japanese samurai armor in NHM's latest exhibition, *Collapse?*. The exhibition opened May 1, 2005 and will run through January 2006.

Jeinous Mehranvari and **Pamela Bartley** are new interns with **Jo Hill** in the Conservation Department of the Fowler Museum of Cultural History (UCLA). Jeinous is a recent graduate of UCLA (BA, Art History) and Pamela comes with a research background in cell biology (PhD, Biochemistry).

In Decorative Arts and Sculpture Conservation at the J. Paul Getty Museum, **Brian Considine** gave a lecture about the theory and history of period rooms in American museums. The lecture was part of the Getty Conservation Institute's "Conservation Matters" series.

Julie Wolfe is progressing on her testing of different fillers for B-72 to make loss compensation putties for marble treatments. The results of her work will be presented at the OSG session at the AIC annual meeting in Minneapolis. Julie has also organized the OSG session for the conference this June with topics on documentation and adhesives. She

is preparing a tip session in collaboration with RATS on the topic of sampling artworks for technical analysis. Graduate Intern **Shelley Smith** is researching Asian and European lacquers in preparation for technical studies of the Rococo furniture.

John Griswold, Dave Harvey, and intern **Morgan Kibby**, of Griswold Conservation Associates completed conservation treatment of Prudence and Patience, the stone lions at the Fifth Avenue entrance to the New York Public Library. GCA has been awarded Preservation Awards by the Los Angeles Conservancy for the Gamble House and Breed Street Shul conservation projects, both of which are part of the national Save America's Treasures program.

John recently presented papers at the *Big Stuff: Conservation of Large Technology Objects* workshop held at the Australian War Memorial in Canberra, and at the *RILEM Workshop on Historic Mortars* at the Delft Technical University, in the Netherlands. John has also completed teaching his third graduate course in Museum Conservation at Cal State University, Fullerton. John has been appointed a Peer Advisor in the Design Excellence Program of the US General Services Administration.

Ellen Hanspach spent last summer as an intern at GCA from the Dresden Academy of Fine Arts. **Denyl Cloughley**, Assistant Conservator at GCA, assisted Dave and John in an architectural finishes assessment of the historic Las Vegas Post Office and Federal Building, site of the infamous Kefauver Hearings on Organized Crime in the 1950s. **Lisa Bethancourt** has helped design and implement databases for conservation assessments and surveys at the Adamson House, the Doheny Mansion, the First Baptist Church, and St. Vincent de Paul Church in Los Angeles. **Stefanie Griswold** has joined the Board of Trustees of Through the Flower, a foundation supporting women in the arts through a focus on the work of artist Judy Chicago.

Ellen Pearlstein wishes to alert the WAAC readership that she has moved to Los Angeles to join the faculty of the new UCLA/Getty Program in Archaeological and Ethnographic Conservation. She is eager to meet her colleagues out west! She can be contacted at: A410 Fowler, UCLA, Los Angeles, CA 90095, 310 794-4940, epearl@ucla.edu.

Carolyn Tallent, paintings conservator, and *Newsletter* Editor, recently returned from a trip to Australia and New Zealand where she visited WAAC member **Sasha Stollman** in Christchurch and former member **Bronwyn Cosgrove** in Melbourne. She also visited paintings conservators **Linda Waters** at the National Gallery of Victoria in Melbourne, **John Harper** in Takaka, NZ, and recurited a new member **Sarah Hillary** at the Auckland Gallery of Art. Linda recently completed an impressive tear reweaving ala Heiber on an unprimed cotton canvas by artist Rover Thomas, and may be persuaded to write a technical note for the *Newsletter*. And yes, New Zealand is as spectacular as advertised.

Regional Reporter:
Virginia Rasmussen

NEW MEXICO

Bettina Raphael, artifact conservator, and **Martha Grim**, textile conservator, have both been working with the Heard Museum in Phoenix over the past months, readying its collection for installation of a new long-term exhibit on Native cultures of the Southwest that is to open in mid May, 2005.

Bettina Raphael will also be participating in a panel presentation at the AAM meetings in Indianapolis in May on "The 'Teaching Museum,'" Integrating Museum Studies into Museum Operations" and will discuss her perspective on how to insure that collections care and conservation principals are better represented in the training of young museum professional through curriculum design and hands-on, practical experience.

The Conservation Lab of the Department of Cultural Affairs/Museum of New Mexico has been busy with many projects. **Conor McMahon** conducted a survey and is treating an historic arms collection, including swords and firearms for the New Mexico History Museum that is currently under construction. With Director of Conservation, **Claire Munzenrider**, Conor is also treating approximately seventy rolled canvases representing copies of the Kuaua Murals from Coronado State Monument. The canvases are being humidified, unrolled, and flattened.

Larry Humetewa has been treating several Native American tanned and beaded leather artifacts and ceramics for the Museum of Indian Arts and Culture in Santa Fe. He is lead conservator for the exhibition *The Pottery of Santa Ana Pueblo* and the upcoming exhibition *Elements of Earth and Fire: (Contemporary Pottery)*both at MIAC. He is also heading a re-housing project of the famous Gustave Baumann marionettes at the MFA.

Paula Hobart is currently completing her third-year internship from Buffalo State College in Objects Conservation with the lab of the Museums of New Mexico. She will be presenting a poster at AIC on a loss compensation for Mexican lacquerware using B-72 films. Paula will be working at San Francisco MOMA in June on the upcoming Richard Tuttle retrospective exhibition. She is also working on a survey of 3-dimensional art in the permanent collection of the Museum of Fine Arts.

Angie Elliot, another third year intern from Buffalo State College in Objects Conservation, is currently completing a study on basket cleaning including the use of Nd:YAF lasers. She recently returned to the Museum of Fine Arts, Boston and Buffalo State College to finish the remainder of her laser cleaning tests and analysis prior to giving a presentation at the 6th International Congress on Lasers in the Conservation of Artworks in Vienna, Austria. She is treating a variety of late 19th-century folding fans from the collection of the Palace of the Governors in Santa Fe.

Associate Conservator **Mina Thompson** is working with Angie Elliot to develop protocols for reducing staining and old repairs on a collection of Mimbres painted pottery excavated at Cameron Creek in southern New Mexico between 1923 - 1928. Mina is also assisting with the installations and exhibits at the El Camino Real State Monument.

Landis Smith and **J. J. Brody**, professor emeritus and author, each shared their expertise and conducted separate workshops on Mimbres ceramics.

Senior Conservator **Maureen Russell** organized a day-long workshop for the lab on various fill materials for 3-dimensional objects. Ev eryone in the lab gave presentations and tips. Maureen is assisting on several upcoming exhibitions including the reinstallation of the historic Tunstall Store in Lincoln, New Mexico and *Explorations in Bronze: Degas and New Mexico Sculptors* from the Museum of Fine Arts in Santa Fe. She will be traveling to the Copia Museum of Art, Food, and Wine in Napa Valley to install the traveling Mayólica exhibition, *Ceramica y Cultura* from the Museum of International Folk Art.

Keith Bakker, objects conservator in Albuquerque, has been teaching a "Seminar in Museum Methods" for the Department of Anthropology at the University of New Mexico. He is also working on the planning committee for the Museums Studies curriculum at the university.

M. Susan Barger is teaching a class on the "Detection of Art Fakes and Forgeries" in her home department, Earth and Planetary Sciences, at University of New Mexico. Both **Steven Prins** and Keith Bakker have been guest speakers in her class. Susan is also working on an evaluation of the New Mexico Historic Records Review Boards Grant Program for the State Archives. She was recently elected to the board of CARTA, the Camino Real del Tierra Aldentro Trails Association. In addition, Susan and **Barbara Hagood** have opened a non-profit organization to help prepare New Mexico's small museums for the New Mexico's Centennial of statehood in 2012.

Regional Reporter:
M. Susan Barger

PACIFIC NORTHWEST

Nicholas Dorman would like to announce that **K. Elizabeth Brown**, the former Objects Conservator at the Smithsonian National Museum of the American Indian, joined the Seattle Art Museum staff as the Objects Conservator, a newly created position, in December 2004. Her responsibilities include the conservation, examination, and treatment of works across SAMs collection. She will also research objects and present findings in lectures, displays, and publications.

Alice Bear Conservation will take on intern **Ginger Bellerud** from the UW Museology graduate program to assist in completing the re-housing and conditioning phase of over 700 Japanese woodblock *sumo* wrestling prints.

J. Claire Dean spent a month in South Africa at the Rock Art Research Institute, University of the Witwatersrand, assisted by **Jae Mentzer** (Conservator, University of Delaware). They carried out a condition survey of the archive and collections in preparation for moving them to a new museum on campus in early 2006. Claire is already planning for new field work in Texas, Washington, Oregon, and California. She is also delighted to let fellow fans of the Lovejoy Ramp Columns (the subject of a couple of presentations at past WAAC meetings) know that two of them are due to be installed in Portland's Pearl District sometime this year under her watchful eye.

Janae Huber, formerly Registrar at the Tacoma Art Museum, has begun a new position in Olympia with the Washington State Arts Commission as their Collections Manager. She will be caring for approximately 4500 artworks located in Washington schools, colleges, universities, and state agencies.

Regional Reporter:
Peter Malarkey

ROCKY MOUNTAIN REGION

In the Spring quarter at the University of Denver, **Laura Downey Staneff** is teaching an introductory preservation course in the Library and Information Science Department. Laura continues to consult for clients in Arizona, New Mexico, and Colorado, and is in the process of renovating her new studio.

Denver Art Museum pre-program interns **Josiah Wagener**, **Paige Isaacs**, and **Dawn Jaros** have been busy interviewing at the conservation training programs. **Kristy Jeffcoat**, Assistant Conservator, has received a scholarship from the Mayer Center for pre-Columbian and Spanish Colonial Art to attend a study tour of Western Spain. This opportunity will allow Kristy to further her research on applied decoration to Spanish Colonial paintings and present her findings to other tour attendants.

Regional Reporter:
Paulette Reading

SAN FRANCISCO BAY AREA

The Objects Conservators at the Fine Arts Museums of San Francisco are very involved in the move and reinstallation of the collection at the new deYoung Museum in Golden Gate Park. This involves on **Leslie Bone's** part conservation work, overseeing of mount-making, and installation of approximately 3000 ethnographic artifacts; for **Elisabeth Cornu** hundreds of decorative arts objects and sculptures, particularly large sculptures for the new sculpture garden; for **Rowan Geiger** dozens of furniture objects; and ongoing frame conservation work for **Natasa Morovic**. The conservation team is supplemented by laboratory interns **Alissa Eagleston, Nancy Mintz**, and short-term project conservators **Blanche Kim** and **Mikhail Ovchinnikov**.

Regional Reporter:
Charlotte S. Ameringer

Robin Tichane (9/16/48 - 2/27/05) -- artist, art conservator, and champion of AIDS awareness: Robin Tichane, who adopted San Francisco for his art and art conservation careers, died Sunday, February 27th in New York from complications of AIDS. He was one of the longest AIDS survivors in the United States. He resided in San Francisco from 1976 to 1996 before he returned to New York City.

Robin was an expert art conservator and art historian who had a fundamental expertise in chemistry. With a Masters in Art History from Columbia University and a Certificate in Conservation from New York University, he ultimately became a conservator in private practice in San Francisco and later an Assistant Conservator at the Asian Art Museum in San Francisco.

As one friend put it – "If he were a musician, I would say he has perfect pitch – as a conservator – he has perfect pitch in color. I have never seen anyone with such a unique talent." He was awarded Honorary Fellow status by the Bay Area Art Conservation Guild in 1990.

After retiring from the art conservation field in 1988, Robin brought his talent and energies to the awareness of AIDS as "the world's pre-eminent post modern disease." He spoke widely on the subject of AIDS in the context of a series of 12 woodblock prints he created entitled *AIDS' Dark Terrain: Twelve Stations from a Yankee Pilgrim*. He viewed AIDS as a passage not of external appearance, but rather as an internal development and exploration of self. Robin's artworks can be found in over 100 museums and archives in the United States and abroad. In addition, he participated in over 24 solo and juried exhibitions from 1991-1996.

In an interview with the *Visual Aid News* in November 1994, Robin was very concerned that AIDS would fall from public attention as the epidemic was prolonged, and he used his work to increase awareness of the disease. His outreach to communicate the understanding of AIDS as one of the 8 to 10 defining events of the 20th century was global. He is survived by his parents Drs. Margene and Robert Tichane of Painted Post, New York, his brother David Tichane of Sunnyvale, and sister Eileen Tichane of Sunnyvale, as well as his circle of friends around the world.

A memorial service for Robin was held on the evening of Thursday, March 24 at the Zen Center, San Francisco. In typical Robin-form, he had designed the service and made the necessary arrangements for carrying out the service over ten years ago. A website has been created (www.robintichane.com) by his family and friends. Donations, in lieu of flowers, for AIDS awareness or Asian Art Museum of San Francisco or Art Conservation would be greatly appreciated. Submitted by **Margaret (Meg) Geiss-Mooney,** friend and former colleague at the Asian Art Museum.

Technical Exchange

The EMG Pen: Safe for Use in Labeling CDs and DVDs

Did you know that many pens commonly used to label CDs, DVDs, and other optical disks may cause permanent damage, making the disk unreadable?

The Electronic Media Group Pen has a felt tip and water-based ink. Other marking pens with fine points or rolling balls, as well as those with solvent-based inks, pose a danger to optical media because they may cause damage that interferes with a laser's ability to read recorded data.

How to use the EMG Pen to label optical media:

Following the guidelines outlined in section 5.2.5 'Marking' of CLIR's *Care and Handling of CDs and DVDs; A Guide for Librarians and Archivists* (Fred R. Byers, October 2003), EMG recommends labeling only on the clear inner hub of the disk.

Two ways to obtain an EMG Pen:

1. Join EMG. Become a member of EMG and receive your EMG Pen FREE! (Current members will receive their pen in the mail.) EMG annual membership dues to AIC members are $15. Membership benefits include access to the EMG listserv and affiliation with AIC's newest speciality group.

Your dues support EMG's programs at the annual AIC meetings, programs which explore some of the newest challenges facing conservators of modern media today. To become a member of EMG, visit the AIC membership web page (http://aic.stanford.edu/about/overview/membership).

2. Purchase

Your purchase of EMG pens supports future EMG programming and education efforts.

Pens are priced as follows:

1-3 pens	$4.00 each
4-10 pens	$3.50 each
11+ pens	$3.00 each

(prices include shipping and handling charges).

To order pens, download the order form http://aic.stanford.edu/sg/emg/pen/pen_order.pdf and follow the printed instructions. Pens will be on sale during the EMG 2005 program at the AIC Annual Meeting in Minneapolis.

To find out more about the EMG specialty group, see http://aic.stanford.edu/sg/emg/ and for the EMG 2005 program see http://aic.stanford.edu/sg/emg/minneapolis2005-NEXT.html

Originally posted on the Conservation Distlist on April 19, 2005 by Kate Murray (kate.murray@emory.edu).

Sources for Rolled Cotton

As you know, Johnson and Johnson, has discontinued its rolled sheet cotton (Red Cross Brand) indefinitely. When asked for a replacement product, a Johnson and Johnson spokesperson suggested Kendal Curity. At this time, most of Johnson and Johnson's distributors are offering the brands Dukal or US Cotton.

Last June, a very informal survey of some of the available options was undertaken by some of the painting and frame conservators at the National Gallery of Art, rating the cotton for use in conservation work.

The poll takers considered such factors as length of fibers, softness, smoothness, etc. We have found that the quality varies considerably, and we recommend asking for samples or at least requesting small orders of new brands before purchasing.

Of course preferences will vary due to personal taste and intended use. Prices reflect those advertised during May 2004. We would be interested to know what other brands people prefer for conservation use. The following list includes the cotton surveyed (more or less in descending order of preference) and general comments (see also note below):

Discontinued Indefinitely

Johnson and Johnson Health System
Product: Red Cross Brand First Aid Rolled Cotton 16 Oz. (Product No. 6026)
425 Hoes Lane
PO Box 6800
Piscataway, NJ 08855
800-255-2500
Note: Recommended Kendal Curity Product No. 6030 as replacement

Somewhat long fibers, soft, rolls well, some nubs, general favorite of those tested

Hanna's Pharmaceutical Supply Company
$100 per case of 25, $3.98 per roll
Product: DE Healthcare Products Rolled Cotton 1 pound roll (Item No. 08-14426-E)
2505 West Sixth St
Wilmington, DE 19805
302-571-8761 (Contact Patty)

Shorter fibers, soft, rolls well, less nubs than Hanna's

Dukal Corporation
$53.75 per case of 25 one pound rolls
Product: Dukal One Pound Cotton Roll 16 Oz. (Reorder #CR1-25)
5 Plant Ave.
Hauppauge, NY 11788
631-656-3800

Note: Also distributed through Mercy Surgical Supply 888-637-2909 who used to be the distributor for Johnson and Johnson.

Fairly long fibers, soft, rolls well, slightly more nubs

Personna Cotton
$154 per case of 12 one pound rolls
Product: Personna Sterile Cotton Roll 16 Oz. (Product No.79410016)
Distributed through Starline Medical by Tryco, Incorporated
6736 Old McLean Village Drive
McLean, VA 22101
800-934-3452 (Contact is Nicole Flesch)
tryco [at] tryco__org

Note: Call or visit Personna website for local area distributor
800-497-7827
www.starlinemedical.com/

Very short fibers, soft, rolls well

Practical Cotton
$8.95 per roll or $173.75 per case of 25 one pound rolls
Product: American Fiber and Finishing Practical Cotton Wool 16 Oz Roll (Item No. TCD 105001)
Talas (distributor)
568 Broadway
New York, NY 10012
212-219-0770
www.talasonline.com
info@talasonline.com

Relatively short fibers, nubs, somewhat scratchy, rolls ok

US Cotton
$112 per case of 20 one pound rolls
Product: Sterile Absorbent Cotton Roll 16 Oz. (Product No.79410016)
401 Marshall Rd
Valley Park, MO
888-835-8029 (Kim in Sales ext. 1126. Shirley in Samples ext. 1122)
(This brand is sold by Square One Medical and, at a better price, by Conservation Support Services. Editor)

Noticeably nubby texture, fairly short fibers, rolls ok

Kendal Curity
$14.62 per bag or $297.39 for case of 25 rolls
Product: Curity Lakeside Cotton Roll (product # 6030)
Tyco Health Care
301-736-9570
800-962-9888

Rough and scratchy, synthetic feel, tough to pull apart, does not roll as well

C&P Healthcare Inc.
$52 for case of 25 one pound rolls
Product: C&P Sterile Cotton Roll 16 Oz. (Item No. 5501)
106 Ferry St.
Fall River, MA 02721
800-626-5582
508-675-0181

Many, many nubs, more expensive, unanimous last place finisher

Fisher Scientific
$18.98 per roll or $474.50 for case of 25 one pound rolls
Product: Absorbent Sanitary Cotton 16 Oz. (Cat. No. 07-900)
800-766-7000
www.fishersci.com/index.jsp

Note: One brand not included in the survey but preferred by one conservator at the NGA is called Webril Wipes, which are made from100% cotton that is spun into sheets and perforated for easy tears. Her opinion is that the cotton is easy to roll with some manipulation and practice. Although the fibers are on the short side, the rolled swabs do not leave fibers behind. Available from

Village Supplies, Ltd.
$8.99/ roll 3802
Product: #8178
West 127th Place
Alsip, IL 60803
708-842-1402
www.villagesupplies.com

Originally posted on the Conservation Distlist on April 19, 2005 by Pamela Betts, National Gallery of Art, Washington, D.C.

Help in Color-Balancing Digital Images

The Qpcard 101 is useful for conservators taking digital images to document conditions or treatments. It is a small, easy to use, and cost-effective aid for color balancing digital images.

The Qpcard 101 is a multi-functional reference card that makes color correction relatively easy during image processing in Adobe Photoshop. The process of gray balancing of the light is fast and results can be considered highly accurate.

The size of each card is just over 5 " by 1 ". A stack of 15 individual Qpcards comes in a lightproof foil package. The pack is sold for about $20 in most good camera stores in the US. Alternatively, you can order by phone for the same price (plus shipping!) from Martin M. Lipton, Argraph Corp. in NJ, (201) 939-7722. General information about this Swedish-made product (including instructions) can be found online at: www.qpcard.com.

Instructions on how to use the Qpcard 101 to correct the color of digital images have been compiled by Yosi Pozeilov. These instructions can be found online in form of a PDF file at: www.pozeilov.com/Qp.

Thanks to Yosi A. R-Pozeilov for sharing his rich experience in the field of photography and for the kind permission to send out his instructions on how conservators can use Qpcard 101.

Please remember that any tip (great or small) is most welcomed. Other WAAC members want to hear about your creative solutions. Submit your trick or recipe to the Technical Exchange column by contacting Agumlich@getty.edu.

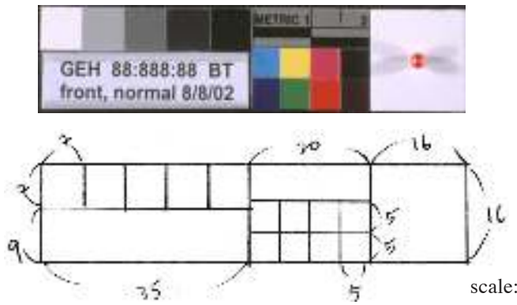
Small Scale Reference Plates for Photodocumentation

Thanks to Dan Kushel and Jiuan-jiuan Chen for permission to print their instructions on how to fabricate small-scale reference plates for photodocumentation.

They have designed two different small-scale reference plates in order to maximize image size of photographs taken for documentation purposes. The plates hold all necessary photographic references and provide space for artifact and image identification. They were originally designed for 35mm-format documentation of 1/6 plate and 1/9 plate daguerreotypes, but are equally useful for the photodocumentation of any small artifacts, or of details.

Construction of the Larger Scale Reference Plate

Overall measurements are 16 mm x 71 mm. The plate is constructed from a piece of 4-ply mat board toned with indelible black ink. (One can use black mat board, but museum-quality board is suggested for best durability.)



scale: mm

The gray scale and color scale (full-intensity only) patches are cut from a Kodak Q-13 Color Separation Guide and Gray Scale (small-20 cm), cat. #152 7654. (Note that as of January 2000, Kodak turned over manufacture and distribution of this item to the Tiffen Company, LLC.)

The gray scale uses only 5 of the 20 steps printed on the Q-13 scale. The individual gray scale patches for the reference plate are cut to measure 7 mm x 7 mm. The steps used are:

Grayscale patch number	A	3	M	13	B
Density	0	.3	.7	1.3	1.6

The color separation patches measure 5 mm x 5 mm and are positioned as follows (full- intensity only):

cyan	yellow	magenta	black
blue	green	red	3/color

The illumination direction indicator at the right end of the plate measures 16 mm x 16 mm. The gnomon is a spherical pin head 3 mm (1/8") in diameter. (Small map pins, available in office supply stores, serve well for this purpose.)

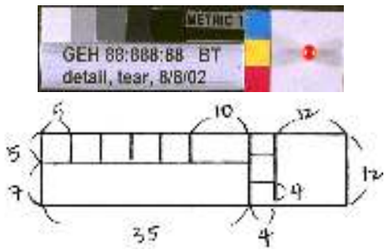
The gnomon can function as a polarized illumination indicator if a pin with a shiny metal head is used. The pinhead will appear black in a standard set up (i.e., vibration direction of the camera's polarizing filter oriented at right angles to that of the polarizing screens) because the reflections of lamps in the pinhead will be at extinction.

The size scale is a 2 cm portion of a gray metric ruler.

The data holder for date and identification information is constructed from a strip of 3 mil (0.003 inch) Melinex® polyester film. The top and bottom edges are folded to create a channel which can hold a paper label with date and other identification data. The data holder measures 35 mm long with a channel width of 9 mm. Because of the small size of the holder, it is easiest to make the first fold, and then trim it to proper width. The second fold is made against a piece of 2-ply mat board cut just a hair line smaller than the size of the channel. Again, the excess polyester is trimmed to proper width. This creates an open channel. In cross-section, the label holder appears:

Construction of the Smaller Scale Reference Plate

Overall measurements are 12 mm x 51 mm. It is also constructed of a piece of 4-ply mat board toned black.



scale: mm

The gray scale contains the same 5 patches as the larger plate. Each patch is cut to measure 5 mm x 5 mm.

Because of the small size, only three of the full intensity color patches are used. Each patch measures 4 mm x 4 mm. They are:

cyan
yellow
magenta

The illumination direction indicator measures 12 mm x 12 mm. The gnomon is a spherical pin head 3mm high.

The size scale is a 1 cm portion of a gray metric ruler.

The Melinex® data holder measures 7 mm x 35 mm.

If you would like to receive these instructions as a word.doc attachment or print-out (with inserted color images) feel free to send your request to Agumlich@getty.edu or call (310) 440-7448.

WAAC Publications

Handling Guide for Anthropology Collections

Straightforward text is paired with humorous illustrations in 41 pages of "do's and don'ts" of collection handling. A Guide to Handling Anthropological Museum Collections was written by Arizona State Museum conservator Nancy Odegaard and illustrated by conservation technician Grace Katterman. This manual was designed to be used by researchers, docents, volunteers, visitors, students, staff or others who have not received formal training in the handling of museum artifacts. Paperbound and printed on acid-free stock.

Price, postpaid:
$8.85 ($6.60 per copy for orders >10 copies)

Loss Compensation Symposium Postprints

A compilation of the talks comprising the Loss Compensation panel from the 1993 meeting at the Marconi Conference Center, enhanced by a detailed introduction into the history of loss compensation theory written by Patricia Leavengood.

Price, postpaid:
$12.50

Back Issues of WAAC Newsletter

Back numbers of the *Newsletter* are available. Issues **before 1993 cost $5 per copy**, issues **from 1993 on cost $10 per copy**. A discount will be given to libraries seeking to obtain back issues to complete a "run" and for purchases of ten copies or more of an issue.

Make your check payable to WAAC. Mail your order to:

Donna Williams

Pigment-Medium Interactions in Oil Paint Films Containing Lead-based Pigments

by Catherine Higgitt, Marika Spring, and David Saunders

During the routine examination of paintings, translucent white lumps or inclusions are often observed in oil paints containing lead-based pigments, including red lead and lead-tin yellow 'type I.' These lumps vary in size, but are usually most easily visible under the microscope, either in cross-sections of paint samples or on the paint surface (Figure 1).

Figure 1 *Lorenzo Costa,* A Concert *(NG 2486), c.1485–95. Poplar, 95.3 x 75.6 cm. Detail of the woman's sleeve and green bodice. The lumpy texture of the green paint is caused by inclusions in the lead-tin yellow underpaint.*

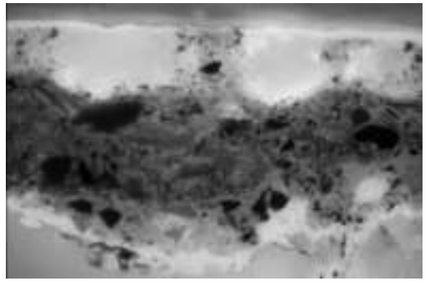
In an example from Moretto da Brescia's *Virgin and Child with Saints Hippolytus and Catherine of Alexandria* from the National Gallery (NG 1165) of about 1538–40 (Figure 2a), large white inclusions with an opalescent appearance can be seen in cross-section in the red lead and vermilion mix that makes up the red of St Hippolytus's hose. These inclusions are seen to fluoresce when illuminated with ultraviolet light (Figure 2b). The inclusions may sometimes be large enough to be seen with the naked eye and appear as pustules that protrude through the surface of the paint. In some cases they may be visible in the X-radiograph of a painting.

Inclusions are quite commonly seen in the red ground layers of seventeenth-century Dutch paintings, which often contain some red lead (as a drier) mixed with red earth pigment. An example of this was observed on a painting by Bartholomeus van Bassen (*An Imaginary Church*, The Royal Pavilion, Libraries and Museums, Brighton and Hove, UK).[1] In a cross-section (Figure 3), one particularly large inclusion is visible in the red ground layer, which has erupted through the upper layers of paint, giving the whole painting surface a pronounced gritty texture. Unreacted red lead particles surround the white translucent pustule.

Figure 3 *Bartholomeus van Bassen,* An Imaginary Church*, 1627. Brighton Museum and Art Gallery. Paint cross-section from the brown foreground. The lower red ground layer contains red earth and red lead, over which is a second brownish-grey ground layer (lead white, black, brown, and red lead). A very large inclusion originating in the lower red ground layer is visible.*

The same phenomenon has also been observed in samples from wall paintings executed in an oil medium.[2] It is related to, but mechanistically different from the dramatic lightening of red lead-containing paint films due to conversion to lead carbonate.[3] The conversion to lead carbonate is frequently seen in wall paintings due to the more extreme (often very damp) environmental conditions to which they are exposed. This conversion occurs not only in oil, but also in a variety of binding media.

Figure 2a and b *Moretto da Brescia,* The Madonna and Child with Saints Hippolytus and Catherine of Alexandria. *Paint cross-section from the red hose of Saint Hippolytus. Two large white inclusions can be seen in the uppermost red layer, which contains red lead and vermilion. 2a. Normal light, 2b. ultraviolet light.*

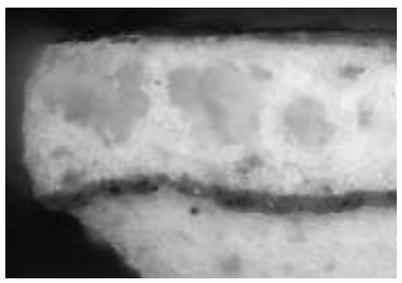


Inclusions have been noted in descriptions of paint samples published as early as the 1970s.[4] They have variously been interpreted as interstices or 'bubbles' within the film resulting from the use of an aqueous binding medium such as egg tempera, or as indicative of the use of a mixed medium or emulsion (with the inclusions being protein or other non-glyceride material).[4,5] It has also been suggested that the lumps are a coarse grade of lead white deliberately added to the paint to give it texture.[6] It is however, only relatively recently, as a result of the availability of Fourier transform infrared (FTIR) microscopy and other analytical techniques, that it has been possible to analyse them reliably, and a number of studies have been undertaken.[7]

This article summarises the findings of our recent studies of the phenomenon undertaken at the National Gallery in London. (Full details of this first large-scale study to provide direct evidence for the nature of inclusions have been published in the *Technical Bulletin*. [8,9]) Previous studies have tended to focus on Northern European seventeenth-century works, but our study demonstrates that the phenomenon is not confined to this period, but is ubiquitous in oil paintings from all over Europe during the period in which lead-based pigments including red lead, Pb_3O_4, and lead-tin yellow 'type I,' Pb_2SnO_4, were used as pigments.

Detailed analyses were carried out on samples from some 35 paintings, ranging in date from the thirteenth to the eighteenth centuries. The study examined a larger group of paintings than had previously been examined, with the aim of providing a broader view of the occurrence of lead soap inclusions and hence a deeper understanding of the mechanism and consequences of their formation. The samples were analysed using optical microscopy, energy dispersive X-ray analysis (EDX) in the scanning electron microscope (SEM), X-ray diffraction (XRD), FTIR microscopy, and gas chromatography–mass spectrometry (GC–MS). In addition, the records of examination of cross-sections held in the Scientific Department of the National Gallery (which date back to the 1950s) demonstrate that these inclusions are particularly common in paint films containing a significant proportion of red lead or lead-tin yellow 'type I.'

Figure 4 The Virgin and Child with Saint John, *German School, 16th century, reverse of the* Master of the Saint Bartholomew Altarpiece, Saints Peter and Dorothy *(NG 707). Cross-section from the highlight of the Virgin's crown. Large translucent white inclusions are visible within the lead-tin yellow paint layer.*



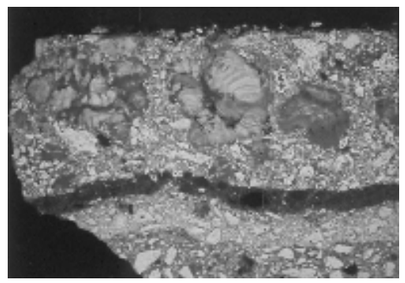
Microscopic appearance and analysis of the inclusions

Figure 4 shows a cross-section of a sample from a painting of *The Virgin and Child with Saint John* by an unknown sixteenth-century German painter, on the reverse of the *Saints Peter and Dorothy* (NG 707) panel of about 1505–10 by the Master of the Saint Bartholomew Altarpiece. Rounded white opalescent inclusions between 30 and 50 microns in size are visible in a yellow paint layer containing only lead-tin yellow of the 'type I' form. Again, as with the sample from the painting by Moretto, the inclusions fluoresce under ultraviolet light and can be seen to be inhomogeneous, with variations in the strength of the fluorescence. This inhomogeneity is even clearer in the back-scattered image (BSI) in the SEM (Figure 5) and distinguishes the inclusions from ordinary coarse particles of lead white that might have been deliberately added to the paint.

EDX analysis in the SEM detected only lead in the inclusions, a result that was true for all of the inclusions examined, even when they were present in lead-tin yellow-containing paints such as this. As in many of the other examples, more highly scattering lead-rich regions with a lamellar structure are visible (which appear lighter in the BSI), usually in the centre of the inclusion, surrounded by less scattering areas that correspond to the regions which fluoresce more strongly under ultraviolet light.

That these lead-containing inclusions only occur when lead-based pigments such as red lead or lead-tin yellow are bound in oil films provides the first clue to the nature of these particles, suggesting that a reaction between the lead-containing pigment and the oil medium might play a part in their formation. FTIR analysis of the inclusions gave remarkably consistent results and showed that the composition of the inclusions was very similar in all the examples studied. In every case they were found to comprise lead carboxylates (lead fatty acid soaps) and lead carbonate (in the basic and/or neutral form), as has also been reported

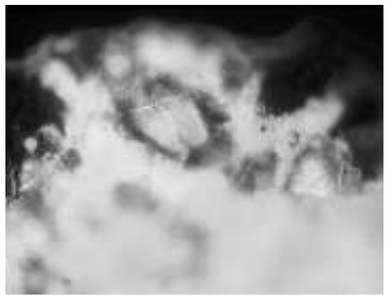
Figure 5 *Reverse of NG 707. Back-scattered electron image of the cross-section from the Virgin's crown (shown in Figure 3).*



by other researchers.[10] Using a FTIR microscope and a diamond micro-compression cell, it was possible to obtain good-quality transmission spectra of the inclusions. The lead soaps were identified by comparison with the literature and standards of various lead soaps prepared in the laboratory.[8,11] Where the inclusions were very homogenous and quite transparent, and interference from other components such as lead carbonate and the oil binding medium was minimal, the lead soaps could be identified as those of palmitic and stearic acids (palmitic and stearic acids are the major monocarboxylic fatty acid components of aged drying oils).[12]

While the results are very consistent, there was some indication from the FTIR spectra evidence that the amount of lead carbonate in the inclusions is variable, as might be expected given the variation in translucency observed in cross-sections under the microscope. The distribution of the components in the inclusions was investigated by FTIR microscopy on a sample of lead-tin yellow paint from Lorenzo Costa's *A Concert* (NG 2486), c.1485-95, where the inclusions are relatively large (Figure 1). The inclusion analysed has a fairly opaque centre with a halo which is more translucent and which also fluoresces more strongly in ultraviolet light (Figure 6). FTIR microscopy demonstrated that the haloes are rich in lead fatty acid soaps while the more opaque centres of the inclusions are rich in lead carbonate.

Figure 6 *Lorenzo Costa,* A Concert. *Unmounted paint fragment from a lead-tin yellow highlight on the brocade of the woman's sleeve. Translucent 'haloes' can be seen around a more opaque core in the inclusions.*



The lead carbonate in Costa's *Concert* is present in the basic or hydrocerussite form, $2PbCO_3 \bullet Pb(OH)_2$, as was found to be the case in the majority of the samples examined.

Thermally-assisted transmethylation GC-MS was used to investigate the presence of fatty acids and dicarboxylic acids (produced by oxidative degradation of a drying oil medium) in the inclusions and surrounding paint.[12,13] Drying oils are rich in the stable, fully saturated monocarboxylic fatty acids palmitic and stearic acids. In addition, fresh drying oils contain unsaturated fatty acids that, because of their double bonds, are reactive and can cross-link up to form polymeric material that allows the oil films to set or 'dry.' These unsaturated fatty acids can also breakdown, on reaction with oxygen, to form smaller molecules, including the dicarboxylic acid azelaic acid, that can be detected in abundance in aged oil films by GC-MS. Analysis of inclusions separated from the bulk of the paint laye r indicated that they contain palmitic and stearic acids (or their derivatives) but generally very little azelaic acid was found. This finding is consistent with the FTIR spectra where there was no indication of the presence of lead azelate.[14] In some cases where inclusions form a large part of the paint layer, GC-MS results for the paint sample as a whole also show a reduced azelaic acid content.

The discovery that the presence of lead soap inclusions can have this effect on the fatty acid ratios measured by GC is particularly significant since a low azelaic to palmitic acid ratio is characteristic of non-drying fats such as those in egg.[12] On the basis of a low azelate level, some previous analyses of the binding media of red lead-containing paint films (before the era of FTIR microscopy) concluded that medium contained egg yolk.[15] If the binding medium does indeed contain egg yolk it must, of course, contain protein, which can now be detected by FTIR microscopy.[16] In all of the cases where GC-MS gave a low azelaic to palmitic acid ratio, FTIR microscopy was used to check for the presence of protein, but none was detected. The 'low azelate effect' seems to be associated with the presence of the inclusions and must be partly responsible for belief that inclusions are globules of protein (emulsion).

Discussion

Red lead (Pb_3O_4) in linseed oil has been extensively studied because of its use as a corrosion-inhibiting paint for iron.[17] It has therefore long been known that lead ions in red lead react with the fatty acids in linseed oil to form lead soaps. Our most recent systematic study of the reaction rates of lead salts with fatty acids has shown that other lead-based pigments and salts can also react to form metal soaps, but that reaction rates vary.[9] For example, lead white (basic lead carbonate) can also react with fatty acids, but the reaction is much slower than for red lead, and indeed no inclusions were found in lead white-containing paint layers in the works examined in the London study, and only low levels of lead soaps were detected by FTIR, spread throughout the films.[8]

The component of the paint that is responsible for lead soap formation is not always immediately obvious. It may not be the major constituent of the mixture, or the only lead-containing species present. In Francisco Zurbarán's painting of *A Cup of Water and a Rose on a Silver Plate* (NG 6566) c.1630, the warm grey shadows of the white cup contain lead soap inclusions. The major component of this paint is lead white, but it also contains some lead-tin yellow, yellow earth, and black. There are more inclusions in the areas depicting the shadows of the cup than in the whiter highlights, suggesting that it is the lead-tin yellow, rather than the lead white, that is responsible for the formation of the inclusions. In the red ground layers of many seventeenth-century Dutch paintings (see Figure 3), inclusions are seen which seem to derive from the small amount of red lead added to the red earth pigment as a drier and of which little or nothing remains.

Recent work suggests that impurities in certain pigments, linked to their method of manufacture, may in fact be responsible for soap formation.[18] Lead-tin yellow 'type I' (Pb_2SnO_4) was traditionally made by heating lead and tin oxides or lead and tin metals and adding red lead with further heating. There is evidence that in the traditionally manufactured pigment there is often unreacted lead oxides or tin oxides in the resulting pigment.[19] It seems likely that it is the lead oxide component in the pigment that forms soaps, rather than Pb_2SnO_4 itself.[18] If lead-tin yellow itself does not react, or reacts very slowly, this would suggest that lead oxide impurities must have been common as the presence of inclusions in lead-tin yellow-containing paints is ubiquitous and almost characteristic. In a similar way, lead white traditionally produced by the 'Dutch' or 'stack' process may contain unconverted lead acetate, and it is possible that it is the presence of lead acetate or other lead salts that are responsible for the reported examples of inclusions in lead white films.[20] Lead white itself does not appear to react significantly, while lead acetate and basic lead acetate react rapidly with fatty acids.[9]

By the nineteenth century, when the use of red lead was much reduced and lead-tin yellow had become obsolete, a large number of other lead-containing materials were being added to paint, primarily to improve its handling or drying properties.[21] It seems likely that most of the occurrences of lead soap inclusions observed in nineteenth- and twentieth-century paintings derive from the interaction of these, often very soluble, lead compounds with the oil medium. For example, lead acetate (sugar of lead) was added to paint layers that now show paint defects, including ground staining, blooming, and inclusions.[22] Zinc-containing pigments, which had been introduced by the nineteenth century, also readily react with fatty acids to form zinc soaps.[23]

While pure lead white does not appear to form inclusions, from the analyses undertaken in London, it is clear that most inclusions contain lead carbonate in addition to lead carboxylates. Our studies conducted at the National Gallery using test films have indicated that, in the presence of carbon dioxide and under conditions of high relative humidity (70% RH or above), red lead in any binding medium can be converted to basic lead carbonate.[3] It is possible that a reaction between red lead or components of red lead (and by analogy other lead salts or their components) and carbon dioxide is occurring in parallel with the formation of lead soaps, yielding the lead carbonate found in the inclusions. It is also possible, however, that only lead soaps are formed initially and that these go on to react with carbon dioxide to form lead carbonate. On balance, it seems likely that the lead carbonate associated with the inclusions forms via the lead soaps, because of the lamellar structure seen in some of the larger inclusions, which suggests that it is 'precipitating' from the lead carboxylate.

Exactly how and why lead soap inclusions form is still not fully understood. In a well-prepared oil paint film, pigment particles will be uniformly dispersed throughout the film. It might therefore be expected that lead soaps will also remain evenly spread throughout the film. However, the lead soaps in many paintings have formed characteristic pustules or agglomerations. For the inclusions to form there must be slow migration of material through the paint film, leading to the formation of coagulated masses of lead soaps. This migration, and the subsequent growth of the inclusion, has in many cases led to distortion of the surrounding paint layers. It is also not clear how quickly the inclusions form.

While the formation of blooms on the surface of paintings indicates that materials can move through paint films, it is not clear what drives the migration and aggregation.[23,24] Changes in polarity of film during ageing may lead to incompatibility between the oil matrix and more mobile components such as saturated fatty acids and their soaps, causing a phase separation.[22,24] There is also evidence that there may be a 'concentration factor' involved, with migration only occurring once fatty acids or metal carboxylates have reached a critical level. The high degree of intermolecular order that is likely to exist within the inclusions perhaps also contributes to the driving force that separates the metal soaps from the more amorphous oil film matrix.[14,25]

The main components of the inclusions have been shown to be the metal soaps of palmitic and stearic acid (both saturated monocarboxylic acids). The absence of other lead soaps, including lead azelate, from inclusions may also be linked to the intermolecular order in the inclusions which makes their incorporation into the inclusions unfavourable since they will not be readily compatible with the ordered lamellar structure that is likely to exist in regions containing long chain monocarboxylate soaps. Alternatively, the absence may simply be linked to hydrophobicity or the mobility of the fatty acid components – lead soaps of palmitic and stearic acids are expected to be much more mobile than lead soaps of azelaic acid, which might explain the lowered azelate levels noted earlier. Thus areas in a film containing pustules will become enriched in palmitate and stearate because of the migration of these species into the inclusion from elsewhere in the film.

Conclusions

A number of important conclusions can be drawn from this study. The translucent inclusions present in oil films containing red lead, lead-tin yellow, and some other lead-based materials, are comprised of lead fatty acid soaps and lead carbonate, formed as a result of reaction of the pigment with the oil binding medium. Such inclusions have been found in paintings from a broad range of geographical locations and dates, demonstrating the widespread nature of this phenomenon.

The lead soap inclusions are not likely to be a deliberate addition to the original paint, as they serve no obvious purpose; they would have siccative properties but the lead pigments with which they are found are themselves good driers. The coarse and lumpy texture of the paint where inclusions are large is unlikely to be a deliberate effect intended by the artist, as has sometimes been thought and they are often encountered in layers that would not be visible. Instead, the inclusions will have formed over a period of time, after the painting was completed, by migration and agglomeration of the lead fatty acid soaps.

An understanding of this reaction, and its effect on fatty acid ratios, has consequences for the interpretation of the results of analysis of the binding medium, particularly if GC–MS is the only analytical technique employed. The presence of inclusions within a paint layer has been shown to affect the fatty acid ratios. Low levels of azelaic acid have regularly been found, which could lead (and has led in the past) to the erroneous conclusion that the binding medium of the paint is egg tempera, or that a mixed medium or emulsion has been used. FTIR microscopy has, however, confirmed that none of the samples examined in this study contain protein.

Inclusions may also pose a problem during cleaning of paintings, as the rather soft waxy lead soaps are vulnerable to mechanical damage. This is evident in Moretto's *Virgin and Child with Saints* (NG 1165) where the tops of the pustules have been flattened. However, lead soaps do not seem to be particularly soluble in commonly used cleaning agents. The rough, gritty surface created by the inclusions can also cause problems during varnishing. Dirt sometimes becomes trapped in the soft lead soaps when they are exposed at the paint surface, which can be visually disturbing in light areas of paint; the white spots created by exposed pustules in dark paint are similarly very noticeable. Thus, a better understanding of the origin and effects of lead soap inclusions is important for the interpretation and treatment of the wide range of paintings that demonstrate this phenomenon.

References

1. We thank Janet Brough of the Royal Pavilion, Libraries and Museums, Brighton and Hove, UK for samples from *An Imaginary Church* by Bartolomeus van Bassen.
2. H. Howard, *Pigments of English Medieval Wall Painting*, Archetype, 2003.
3. D. Saunders, M. Spring, and C. Higgitt, 'Colour change in red lead-containing paint films,' *ICOM-CC 13th Triennial Meeting*, Rio de Janeiro 2002, pp. 455–63.
4. L. Kockaert, 'Note sur les émulsions des Primitifs flamands,' *Institut Royal du Patrimoine Artistique Bull*., XIV, 1973/4, pp. 133–9.
5. J.R.J. van Asperen de Boer, M. Faries, and J.P. Filedt Kok, 'Painting technique and workshop practice in Northern Netherlandish Art of the sixteenth century,' in *Kunst voor de beeldenstorm*, Amsterdam 1986, p. 109; L.E. Plahter and U.S. Plahter, '*The young Christ among the doctors* by Teodoer van Baburen: Technique and condition of a Dutch seventeenth century painting on canvas,' originally published in *Acta ad archaeologiam et artium historiam pertinentia*, Vol. III, 1983 and reprinted in *Conservare Necesse Est, for Leif Einar Plahter on his 70th Birthday*, IIC Nordic Group, Oslo 1999, pp. 42–65.
6. U. Plahter, 'Baburen re-examined,' *Conservare Necesse Est, for Leif Einar Plahter on his 70th Birthday*, IIC Nordic Group, Oslo 1999, pp. 66–7.
7. K. Brunnenkant, 'Falscher Glanz? Technologische Untersuchung des "W.Kalf.1643" signierten Prunkstillebens im Wallraf-Richartz-Museum in Köln und Vergleich mit Werken aus der Pariser Periode Willem Kalfs (ca. 1619–1693),' *Zeitschrift für Kunsttechnologie und Konservierung*, 13, 1999, pp. 245–84; J.J. Boon, J. van der Weerd, K. Keune, P. Noble, and J. Wadum, 'Mechanical and chemical changes in Old Master paintings: dissolution, metal soap formation and remineralization processes in lead pigmented ground/intermediate paint layers of 17th-century paintings', *ICOM-CC 13th Triennial Meeting*, Rio de Janeiro 2002, pp. 401–6; P. Noble, J.J. Boon, and J. Wadum, 'Dissolution, aggregation and protrusion. Lead soap formation in 17th century grounds and paint layers,' *ArtMatters - Netherlands Technical Studies in Art*, 1, 2002, pp. 46-61.
8. C. Higgitt, M. Spring, and D. Saunders, 'Pigment-medium interactions in Oil Paint Films containing Red Lead or Lead-tin Yellow,' *National Gallery Technical Bulletin*, 24, 2003, pp. 75-95.
9. Manuscript in preparation.
10. R.M.A. Heeren, J.J. Boon, P. Noble, and J. Wadum, 'Integrating imaging FTIR and secondary ion mass spectrometry for the analysis of embedded paint cross-sections,' *ICOM-CC 12th Triennial Meeting*, Lyon 1999, pp. 228–33; J. van der Weerd, J.J. Boon, M. Geldof, R.M.A. Heeren, and P. Noble, 'Chemical Changes in Old Master Paintings: Dissolution, Metal Soap Formation and Remineralisation Processes in Lead Pigmented Paint Layers of 17th-Century Paintings,' *Zeitschrift für Kunsttechnologie und Konservierung*, 2002, 16, pp. 36–51; K. Keune, P. Noble, and J.J. Boon, 'Chemical changes in lead-pigmented oil paints: on the early stage of formation of protrusions,' *Art 2002, Antwerp, June 2002*, eds R. Van Grieken, K. Janssens, L. Van't dack, and G. Meersman, unpaginated.
11. L. Robinet and M.-C. Corbeil, 'The characterization of metal soaps,' *Studies in Conservation*, 48, 2003, pp. 23-40.
12. J.S. Mills and R. White, *The Organic Chemistry of Museum Objects*, 2nd edn, London 1994.
13. R. White and J. Pilc, 'Analyses of Paint Media,' *National Gallery Technical Bulletin*, 17, 1996, p. 95.
14. M.J. Plater, B. De Silva, T. Gelbrich, M.B. Hursthouse, C.L. Higgitt, D.R. Saunders, 'The characterisation of lead fatty acid soaps in 'protrusions' in aged traditional oil paint', *Polyhedron*, 2003, 22, pp. 3171–9.
15. P.C. van Geersdaele and L.J. Goldsworthy, 'The Restoration of Wall-painting Fragments from St. Stephen's Chapel, Westminster,' *The Conservator*, 2, 1978, pp. 9–12.
16. J. Pilc and R. White, 'The Application of FTIR-Microscopy to the Analysis of Paint Binders in Easel Paintings,' *National Gallery Technical Bulletin*, 16, 1995, pp. 73–84; R.J. Meilunas, J.G. Bentsen, and A. Steinberg, 'Analysis of Aged Paint Binders by FTIR Spectroscopy,' *Studies in Conservation*, 35, 1990, pp. 33–51.
17. E. West Fitzhugh, 'Red Lead and Minium,' *Artists' Pigments: a Handbook of their History and Characteristics*, Vol. I, ed. R.L. Feller, New York 1986, pp. 109–39; J.E.O. Mayne, 'Pigment Electrochemistry,' *Pigment Handbook,* Vol. III: *Characterisation and Physical Relationships*, ed. T.C. Patton, New York 1973, pp. 457–64.
18. J.J. Boon, E. Gore, K. Keune, and A. Burnstock, 'Image analytical studies of lead soap aggregates and their relationship to lead and tin in 15th-C lead tin yellow paints from the Sherborne triptych', *Proceeding of the 6th IRUG conference*, Florence, 2004.
19. H. Kühn, 'Lead-Tin Yellow,' *Artists' Pigments: a Handbook of their History and Characteristics*, Vol. II, ed. A. Roy, New York 1993, pp. 83-112; N. Eastaugh, V. Walsh, T. Chaplin, and R. Siddall, *The Pigment Compendium, A dictionary of historical pigments*, Elsevier, 2004, p. 231.
20. R.J. Gettens, H. Kühn, and W.T. Chase, 'Lead White,' *Artists' Pigments: a Handbook of their History and Characteristics*, Vol. II, ed. A. Roy, New York 1993, pp. 67-81.
21. L. Carlyle, 'Paint Driers Discussed in 19th-Century British Oil Painting Manuals,' *Journal of the American Institute for Conservation*, 38, 1999, pp. 69–82; L. Carlyle, *The Artist's Assistant*, London 2001, pp. 41–54.
22. J. Zucker 'From the Ground Up: The Ground in 19th-Century American Pictures,' *Journal of the American Institute for Conservation*, 38, 1999, pp. 3–20; J.D.J. van den Berg *Analytical Chemical Studies on Traditional Linseed Oil Paints*, PhD Thesis, University of Amsterdam, 2002.
23. J. Koller and A. Burmester, 'Blanching of unvarnished modern paintings: a case study on a painting by Serge Poliakoff,' in *Cleaning, Retouching and Coatings: Technology and Practice for Easel Paintings and Polychrome Sculpture*, eds J.S. Mills and P. Smith, IIC, London 1990, pp. 138–43; L.A. O'Neill and R.A. Brett, 'Chemical reactions in paint films,' *Journal of the Oil and Colour Chemists' Association*, 52, 1969, pp. 1054–74; J. van der Weerd, *Microspectroscopic Analysis of Traditional Oil Paint*, PhD Thesis, University of Amsterdam, 2002, Chapter 8.
24. E. Ordonez and J. Twilley, 'Clarifying the Haze: Efflorescence on Works of Art,' *Analytical Chemistry*, 69, 1997, pp. 416A–22A; S.R. Williams, 'Blooms, Blushes, Transferred Images and Moldy Surfaces: What are these Disfiguring Accretions on Art Works?' *Proc. of the 14th annual IIC-CG conference*, Toronto 1989, pp. 65–84.
25. J.-M. Rueff, N. Masiocchi, P. Rabu, A. Sironi, and A. Skoulios, 'Synthesis, Structure and Magnetism of Homologous Series of Polycrystalline Cobalt Alkane Mono- and Dicarboxylate Soaps,' *Chemistry – A European Journal*, 8, 2002, pp. 1813–20.

A New Approach to Cleaning I: Using Mixtures of Concentrated Stock Solutions and a Database to Arrive at an Optimal Aqueous Cleaning System

by Chris Stavroudis, Tiarna Doherty, and Richard Wolbers

Introduction

The Modular Cleaning Program is a new database system designed to assist the conservator in the cleaning of works of art. The Modular Cleaning Program debuted in September, 2003, at the Verband der Restauratoren (VDR) symposium "Surface Cleaning – Materials and Methods." Version 1.3 of the Modular Cleaning Program was released via Conservation On Line in February of 2004. The Modular Cleaning Program is an interactive computer program that is best understood by demonstration and use. As that option is not available in the context of a written work, we will examine the history of surface cleaning, discuss the features of the cleaning program, and present two case studies.

The Modular Cleaning Program builds upon developments in cleaning theory and extends the theoretical towards the practical. Innovations include the use of pre-mixed, concentrated stock solutions which facilitate the rapid formulation of test cleaning solutions; formulations based on physical constants, equilibrium equations, and other theoretical constructs; and the use of a computerized system to coordinate the mixing and testing of the solutions. While developed from the perspective of paintings conservation, the methodology is universal and applicable to any aqueous cleaning. The first case study will illustrate the removal of a grime layer from an aged varnish. The second, involving the removal of a grime layer from an unvarnished paint surface, demonstrates how the program can expand the repetoire of choices. In this case the conservator found an unexpected solution to the cleaning problem because the program facilitates experimentation.

A Review of Aqueous Surface Cleaning

Historically, in conservation and restoration treatises on paintings, little attention has been paid to surface cleaning in comparison to removing surface coatings. Manuals on the conservation of paintings traditionally have included brief discussions of dry methods of surface cleaning, including the use of dusting brushes and cloths, erasers, and sponges. Foodstuffs, including fresh breadcrumbs, "cakes," potatoes, and onions have also been mentioned (Mora et al. 1984; Keck 1978). Some older published instructions for surface cleaning paintings prove to be quite extraordinary. Theodore De Mayerne's manuscript from the seventeenth century suggests: *"Melt common carpenter's glue, which is quite thick, and pour it, melted over your picture, leave it after it has set... on your picture – then lift it off, all in one piece. This brings with it all the dirt. See if this can come off without damaging the piece (Caley 1990)."*

Water and saliva, used for spit-cleaning, are perhaps the most common materials used for surface cleaning paintings. The addition of materials to water (whether 'de-ionized' or not) has predominantly been limited to the addition of alkalis. Ammonia is perhaps the most common alkali that has been added to water in the twentieth century to adjust the pH of the solution for surface cleaning easel and wall paintings (Mora 1984). The use of methylcellulose gels and paper pulps with water-based systems have also been advocated where prolonged contact with the surface is necessary and/or when mechanical action should be avoided.

Advancements in the petrochemical industry at the end of the nineteenth century led to the development of surfactants and detergents. With these new materials available, the approach to cleaning chemistry became more sophisticated in the twentieth century and commercial, proprietary cleaning products found applications in conservation.

Soaps have long been used in conservation studios even though their exact chemistry may not have been well understood. The use of strong soaps led to a warning against using soaps as a category of cleaning agent in the 1940 *Manual on the Conservation of Paintings*: *"It is perhaps not superfluous to issue a warning against a method of cleaning pictures still in use in recent years in many galleries – washing the painted surface with soap and water. The evil effects of this system are not immediately apparent; but the water may penetrate by capillary attraction through the slightest cracks or fissures in the paint film as far as the priming, which means that sooner or later the film will become detached or swollen, not to mention the bad effects on the varnish (International Institute of Intellectual Co-operation [1940] 1997)."* The addition of "soap" to water-based cleaning systems is sometimes mentioned in cleaning manuals from the twentieth century, however, there is usually no mention of the specific types of soaps nor discussion of their chemical properties.

In the second half of the twentieth century, conservators began using commercial detergents. Detergents found applications in cleaning painted surfaces after having been used in the fields of objects and textile conservation (Plenderleith 1956). For painted surfaces, detergents such as Triton X-100, Synperonic DNB, Igepal, and Vulpex were used (Ramer 1979; Barov 1990; Burnstock 1990). These detergents found wide application since they are soluble in water and/or solvents. Today, Triton XL-80N and Synperonic N are the more commonly used non-ionic surfactants (McCutcheons 2003).

The properties of surfactants have been exploited through the use of proprietary materials such as Photo-flo (developed for use in photography) and even products such as Barbisol, a shaving cream. These types of materials have been used by some conservators as saponifying additives or as additives that help break surface tension in cleaning applications (Rothe 2002).

Alternatives to water-based surface cleaning were also developed, such as those discussed by the paintings conservator Helmut Ruhemann in his description of the proprietary material "Cleaning, Reviving, and Preserving Paste" from C. Robertson in London: *"Alkaline wax emulsions are often used for removing this dirt surface. The widely used mixtures of much diluted wax and varnish have the great disadvantage of removing only part of the dirt and fixing the rest. Moreover they dry so slowly that they collect a great deal of dust before they are hard (Ruhemann 1968)."*

From mid-century onward a number of conservators began publishing their own formulations for surface cleaning systems. Some of the more famous formulations include "AB 57," which was introduced by Philipo and Laura Mora for surface cleaning insoluble salts that compromise inorganic incrustations on wall paintings (Mora 1984).

In the late 1980s Richard Wolbers introduced new approaches to cleaning paintings in a series of five annual workshops conducted at the Getty Conservation Institute (Wolbers 1988). His recent book, *Cleaning Painted Surfaces*, is devoted to the subject of aqueous methods. It is important to note that Wolbers' methodological approach to the subject of surface cleaning may be applied to all types of painted surfaces. Wolbers advocates designing cleaning systems specific to the materials and cleaning challenge presented.

Leslie Carlyle was perhaps the first paintings conservator to find application for chelating agents in surface cleaning painted surfaces (Carlyle 1990). Wolbers incorporated them into his cleaning workshops in the late 1980s. Chelating agents found wider application in conservation in the mid 1980s and were the subject of a number of published research projects (Carlyle 1990; Phenix 1992).

In 1990 the conference "Dirt and Pictures Separated" was held. Papers presented at the conference, and published under the same title, addressed the chemistry of surface cleaning materials as well as the effects of surface cleaning on painted surfaces. Specific surfactants and cleaning agents discussed in the papers included Triton X-100, Synperonic N, di- and tri-ammonium citrate (Hackney 1990).

The developments in cleaning chemistry have led conservators to understand traditional methods of surface cleaning better. Towards the end of the twentieth century, conservators have tried to imitate the cleaning chemistry and properties of saliva for surface cleaning. Formulations that have been described as "synthetic saliva" have been published (Bellucci 1999; Wolbers 2000).

The Modular Cleaning Program extends and facilitates the development of surface cleaning by use of a computer, much as earlier programs ("TeasTime," Henry 1995; "Triansol: il Triangolo delle solubilità," Cremonesi 1999; "Solvent Solver," Ormsby 2001) assisted conservators in their approach to solvent cleaning. Also like these other programs, the Modular Cleaning Program is shared, at no cost, with the conservation community.

The Basic Principles

From 1997 to 2001 Richard Wolbers collaborated with the Getty Conservation Institute in development of the Gels Research Project to evaluate alternative methods of cleaning (Dorge 2004). An aspect of this project was the discussion of a "logic tree" approach to selecting cleaning systems – intended to be an insight, as it were, into Professor Wolbers' thought process when selecting a cleaning system (Dorge 2004, 141-144). The nascent system, as it applied to water-based cleaning, was modified and built into the Modular Cleaning Program by Chris Stavroudis.

The aqueous cleaning systems introduced by Richard Wolbers can be considered to consist of five orthogonal components (mutually independent components). They are: water, pH buffer, chelating agent, surfactant, and gelling agent. For this reason, the concentrate system is based on a module of five. The test cleaning solutions are made to a total of five parts, which may include some or all of the five components. (If only one or two components are being tested, water is added to make up the total of five parts.) Hence, each stock solution is concentrated five times its normal working concentration. The computer screen has also been divided into five rows. Each row represents one of the five components, or more practically, one milliliter of a concentrated stock solution.

For example, to make a test solution, one mL of water is combined with one mL of a buffer concentrate solution plus, optionally, one mL of concentrated chelating agent solution, and/or one mL of concentrated surfactant solution, and/or one mL of concentrated gelling agent. If necessary, water is added to make up the final total volume of 5 mL.

The Modular Cleaning Program and the use of concentrated stock solutions allows the conservator to test a large range of mixtures in a short period of time. Since the program allows conservators to test far more cleaning options than they would normally have time to test, it is hoped that conservation treatments can continue to move toward more delicate and sensitive cleanings.

The first parameter to consider in formulating an aqueous cleaning system is pH. Control of pH is important in aqueous cleaning systems. As a general rule, as materials age they oxidize. In organic materials, oxidation leads to the formation of acid functional groups on the surface exposed to oxygen in the air. The acid forms of the oxidized molecules tend to be less soluble in water than the deprotonated salt forms. Since acids react with bases, a higher pH will tend to deprotonate the acid and render it more soluble in water. So, as a general rule, higher pHs will assist in the solubilization of the oxidized material while lower pHs will tend to preserve an oxidized surface.

By buffering a cleaning solution, we ensure that the chosen pH of a solution is maintained during the cleaning. Buffers are weak acids or bases that, at certain pH values, minimize changes in the pH of a solution when additional acid or base is added to the mixture. Buffering a cleaning solution prevents the pH of the cleaning solution from changing as the oxidized organic material dissolves in the course of the cleaning.

Buffers are characterized by their pKa, their acid dissociation constant. Analogous to pH, the pKa is the pH of an aqueous solution, which contains equal parts of the acid form of the buffer and its base form. This is also the pH where the buffer will function most effectively at preventing pH changes from small additions of acid or base to the solution. A weak acid or base will function as a buffer within about 1 pH unit of its pKa value.

The Modular Cleaning Program uses the molecular weight of the buffer and its pKa to perform one of its primary functions, the calculation of the desired amounts of reagents to be mixed into concentrated stock solutions. The concentration of the buffer solution is specified by the conservator. Based on measurements by Richard Wolbers, the recommended target buffer concentration for paint surfaces is 0.05M. Therefore the concentration of the concentrated buffer stock solution is 0.25M (since it will be diluted by 5 when incorporated into a test cleaning solution).

On the computer screen each row is divided into three columns (fig. 1). The center column has buttons which allow the properties of the test cleaning solution to be modified. In the case of buffers, the conservator can choose to increase or decrease the pH of the test solution. Changing the pH usually means changing the buffer used (Tris, bicine, MES, etc.) because each weak acid or base has only a limited buffer range.

This correlates with choosing a concentrated stock buffer solution to be used when mixing a test cleaning solution. Above the buttons is the description of the concentrated stock solution. In Figure 1, the pH 7.5 buffer is Tris (2-amino-2-(hydroxymethyl) propane-1,3-diol), neutralized with hydrochloric acid (HCl), the chelating agent is citric acid pH adjusted to 7.5 with sodium hydroxide (NaOH), and the surfactant is Triton XL-80N, a nonionic surfactant.

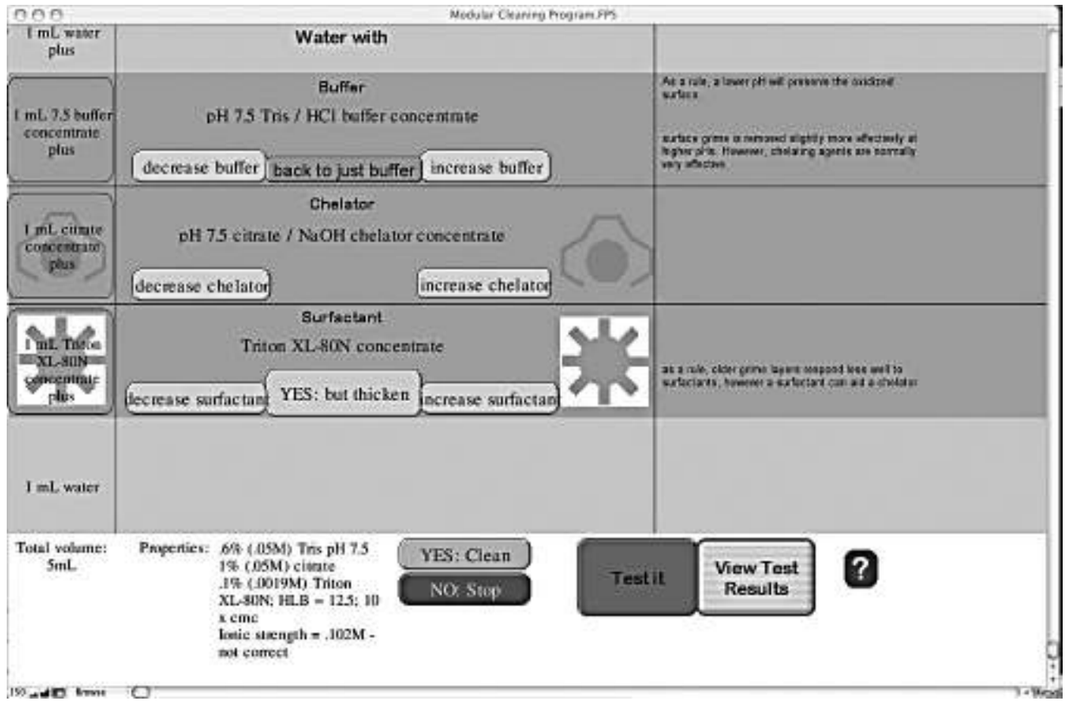
The left column shows the amount of the concentrated stock solution to be added to the test cleaning solution and a logo that is used to distinguish each solution. The logo also appears on the concentrated stock solution's label. Clicking on the logo takes the conservator from the "Modular Cleaning Program" database to the "solutions" database, described later.

The right column shows hints or comments pertinent to the type of work being treated, such as how pH will affect an aged varnish layer or how pH influences the removal of the aged surface grime. Hints have been built into the database for some of the materials to be found on paintings. As the program is used by more conservators, hints will be added and expanded. The comments are not by any means a suggestion as to how the work of art should be cleaned, but rather a reminder of how each component of a cleaning system might affect what is to be removed and how it might affect the substrate.

The background color of the rows in the Modular Cleaning Program change to indicate the pH of the test cleaning solution. (The colors were chosen to resemble those of pH test papers.)

In addition to water and a pH buffer, test cleaning solutions can be mixed to include surfactants, chelating agents, and gelling agents. When using the system, the conservator would choose to add these components based on the progress of the test cleaning. They can be added to the testing scheme in any order. The following paragraphs will discuss each of these agents and how they are integrated into the Modular Cleaning Program.

Figure 1. The Modular Cleaning Program's aqueous test cleaning screen. Shown is a test cleaning solution consisting of water and Tris buffered to pH 7.5 with citrate added as a chelator and Triton XL-80N added as the surfactant. No gelling agent has been specified so the 5th component, an additional 1mL of water, indicated by the lower band brings the final volume of the test cleaning solution to 5mL.



The term surfactant is derived from "surface active agent" and is an encompassing term that refers to detergents, soaps, emulsifiers, wetting agents, and resin soaps. The first property we need to know about a surfactant is whether it is ionic or nonionic. A nonionic surfactant is a neutral species in solution, neither an acid nor a base. In practical terms, this means it can be used predictably at any pH. Ionic surfactants can be anionic (the surfactant molecule is an acid), cationic (a base), or zwitterionic (where the molecule consists of both acidic and basic functional groups). If a surfactant is anionic or cationic, being an acid or a base, it is further characterized by a pKa. The pKa and, if known, the solubility of the fatty, undisassociated molecule in water determine the minimum pH at which the surfactant can be used. If these values cannot be found in the literature, the database also accepts an ad hoc measurement of the pH at which the ionic surfactant solution separates into two phases, water and an oily or solid phase.

The other parameters that describe a surfactant are HLB, CMC, and aggregation number (plus its molecular weight). HLB is the hydrophilic lipophilic balance number, a measure of the relative size of the water-soluble portion of the surfactant in relation to the fatty portion of the molecule. Anionic surfactants can have HLB values as high as 40 (like sodium lauryl sulfate – Orvus), but non-ionics have a maximum HLB value of 20.

CMC stands for the critical micelle concentration. Detergency occurs when a critical amount of a surfactant in solution is reached and the surfactant molecules group into micelles. In an aqueous solution, the surfactant molecules orient themselves with their fatty ends to the inside and the water soluble ends to the outside of the micelles. Micelles can form around fatty, non-polar material and aid its being carried away in water. The concentration where micelles just begin to form is termed the critical micelle concentration. When formulating a detergent, you want to have surfactant present in excess of the CMC, so it can carry grime away, but not too much of an excess because that will have a tendency to leave excess detergent behind, complicating rinsing and clearance.

The aggregation number is the average number of surfactant molecules that form into a micelle. The aggregation number is characteristic for each surfactant. The larger the number the more surfactant you will have to put into solution in excess of the CMC to get a given concentration of micelles. A lower aggregation number means you can use a bit less surfactant.

The Modular Cleaning Program allows the surfactant to be specified either as a simple concentration or as a multiple of the CMC. A typical value is to have the working concentration of the surfactant at 5x the CMC, which means that the concentrated stock solution is at 25x the CMC. When both the CMC and aggregation numbers are known, the program also calculates the micelle concentration.

Surfactants are added to the test cleaning solution in the database by clicking on the "Yes, But Modify" button. As with the buffer, the surfactant can be increased or decreased by clicking on the buttons in the center column, selecting higher or lower HLB surfactants. The computer will not recommend an ionic surfactant below its critical pH.

A chelating agent, is a molecule capable of binding to a metal ion and bringing the metal ion into solution. The chelating agents conservators commonly use for surface cleaning are citric acid (as various citrates) and EDTA (ethylenediaminetetraacetic acid). Chelating agents have multiple coordination sites, which allow the molecule to envelop and bind to a metal ion.

Many of the coordination sites on a chelating agent are carboxylic acid groups, so chelating agents are specified by multiple pKa values – citric acid has three acid groups, EDTA has four, and DTPA (diethylenetriaminepentaacetic acid) has five carboxylic acid groups, each having a different pKa value. At any given pH, the chelating solution will contain molecules with various combinations of disassociated acid groups. The amount of each species in solution is calculated by the computer at each concentrated stock solution's pH.

The effect of pH on chelating agents is very complex, and a thorough discussion of the topic is beyond the scope of this paper. One consequence of the complexity is that while some concentrated stock solutions can function at any pH, for instance you only need one bottle of a concentrated nonionic surfactant stock solution which can be added to any test cleaning solution, a separate concentrated chelating agent stock solution must be mixed for each pH.

Chelating agents are also characterized by their affinities (formation constants) for different metal ions. These formation constants will be used in a future version of the database to calculate the necessary concentrations of metal ion buffers to be added to a cleaning solution to minimize solubilization of a desirable ion, i.e. one that is part of the work of art. In this current version of the Modular Cleaning Program the formation constant for the calcium ion is used as the indication of strength of the chelating agent. Clicking the increase or decrease buttons for chelating agents in the database selects chelating agents with higher or lower values of the calcium formation constant.

Test cleaning solutions may also be gelled by adding a concentrated gelling agent. The database supports nonionic (cellulose ethers) and cationic (Carbopol) gelling agents. In practice, using the gelling agents is difficult because the concentrates, being five times the gel's working concentration, are very stiff and difficult to disperse in the test solution. The gelling agents are ranked by their viscosity at a given concentration.

There exist many other ways to modify an aqueous cleaning system, and many of these will be incorporated into future versions of the Program. These modifications can be made by the conservator now, but are not supported by the database. The addition of co-solvents (small amounts of organic solvents), ionic buffers (soluble salts to modify the ionic strength of the test cleaning solution), enzymes, and multiple surfactants are all possibilities.

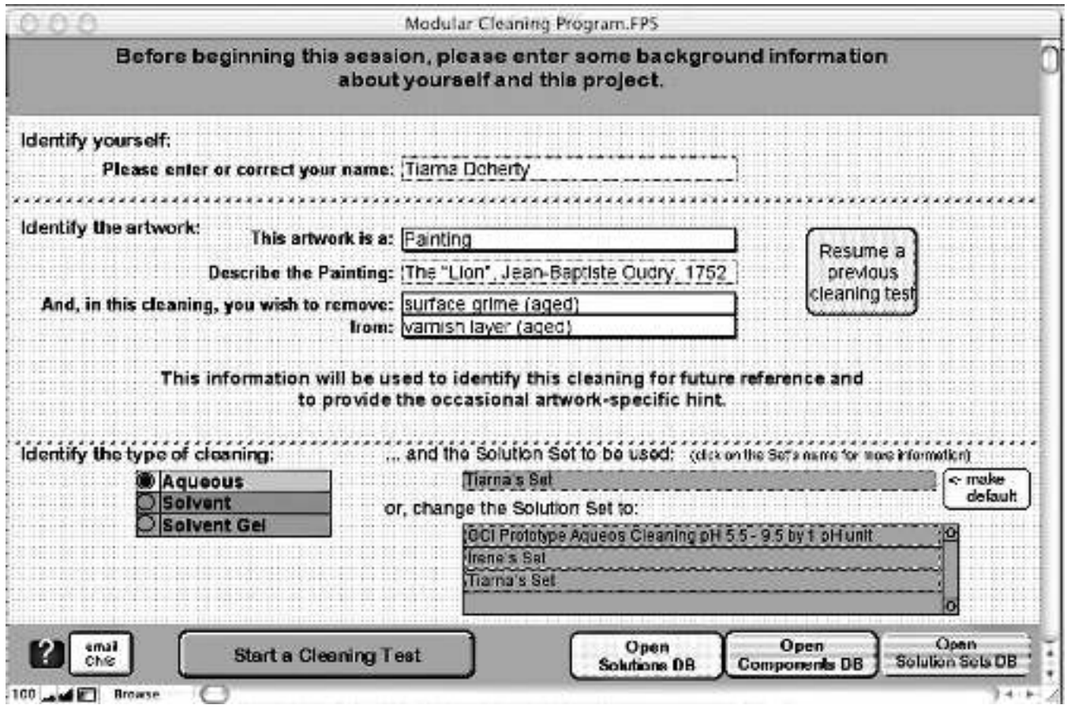
The Modular Cleaning Database is comprised of 19 interrelated databases. However, from the user's perspective, the system is made of five main parts. When the Modular Cleaning Program is started, after the "welcome" screen, the conservator is taken to the "background" page (fig. 2), where the parameters of the cleaning are established. This is where the work of art and conservator are identified, and the material being removed and the substrate from which it will be removed are entered. There are buttons on the "background" page to take the conservator to the "components" database, the "solutions" database, and the "solution sets" database.

The "components" database is the most conventional database with which the conservator will interact. It contains information on hundreds of chemicals used in conservation: buffers, chelating agents, surfactants, gelling agents, acids, and bases from which the concentrated stock solutions are mixed. It also includes solvents, which will be used in future versions of the software, and even some polymers and resins. It lists chemical composition, physical properties, and may list health and safety information, the MSDS, and include a link to the information in the most current NIOSH (the US National Institute for Occupational Safety and Health) Pocket Guide to Chemical Hazards. (Not all chemicals in the database have NIOSH listings.) The MSDS information in the database is taken from Internet sources and is listed as an information-only reference. Conservators should always consult the MSDS sheet provided by their chemical supplier.

The physical chemical constants included in the "components" database in most cases include a reference to the publication from which they were taken. Numerous sources were consulted (Freiser & Fernando 1963; Weast 1972; Freiser 1992; Huibers 1996; Wolbers 2000; Lide 2002; Harris 2003; McCutcheon's 2003). In the case of surfactants, finding the necessary physical properties and physical constants has been challenging since many of these properties seem never to have been quantified as they are so complicated to measure precisely.

The "solutions" database is where components are mixed together to make the concentrated stock solutions. The database performs numerous calculations based on the physical constants located in the "components" database. Because the pH values of the concentrated solutions are known (having been chosen by the conservator and been set with a pH meter) the complex ionic equilibrium equations can be solved exactly. The "solutions" database also calculates recipes and mixing directions for the concentrated stock solutions and formats the appropriate labels that can be printed to identify the concentrated stock solution containers.

Figure 2. The "background" page where the parameters of a cleaning are selected by the conservator.



The "Modular Cleaning Program" database combines the concentrated stock solutions from the "solutions" database to make the test cleaning solutions. This database calculates the solution properties of all the components in the test cleaning solution. Though it only ever possesses one record, that is, the test cleaning solution that is being evaluated, the database combines information from almost all of the other databases to allow the conservator to orchestrate the testing process. When the optimal cleaning solution has been determined by testing, it calculates the formula of and recipe for the cleaning solution.

The "solution sets" database organizes and builds families of the concentrated stock solutions into sets that can be chosen by the conservator at the start of a treatment. In the future, customized sets of concentrated stock solutions may be developed for special cleaning problems like the cleaning of acrylic paint surfaces or stain removal from marble. There is also a database that keeps track of the testing process. When the "Test it" button is clicked, that Modular Cleaning Program database copies the relevant information about the current test cleaning solution into the "test it" database. The conservator is prompted to enter information about the test cleaning solution's effect on the material being removed and on the substrate, which should be preserved. This information is retained and can be viewed (by clicking on the "view test results" button) or printed out (by clicking the "print" button from the view test results page) to document the testing process that led to an optimal cleaning solution. It also allows testing to be resumed in cases where the testing is interrupted.

Navigation through the databases is simple and intuitive. All navigation is via mouse clicks, either on buttons or on key words on the screen. Specific knowledge of FileMaker Pro is not necessary to use the program. During a cleaning test, clicking on the left, logo column of a cleaning component will take the conservator to the information in the "solutions" database for that concentrated stock solution (fig. 3).

From the "solutions" database, clicking on the button bars for any of the ingredients that comprise the concentrate takes the conservator to the information on that material in the "components" database (fig. 4).

From the "components" database, clicking on the "Properties" button takes the conservator to the physical and chemical information that is specific for that material (fig. 5) (The kind of information presented for a chelating agent is different from that for a surfactant.)

Figure 3. The specification of the pH 7.5 Tris buffer concentrated stock solution as displayed in the "solutions" database.

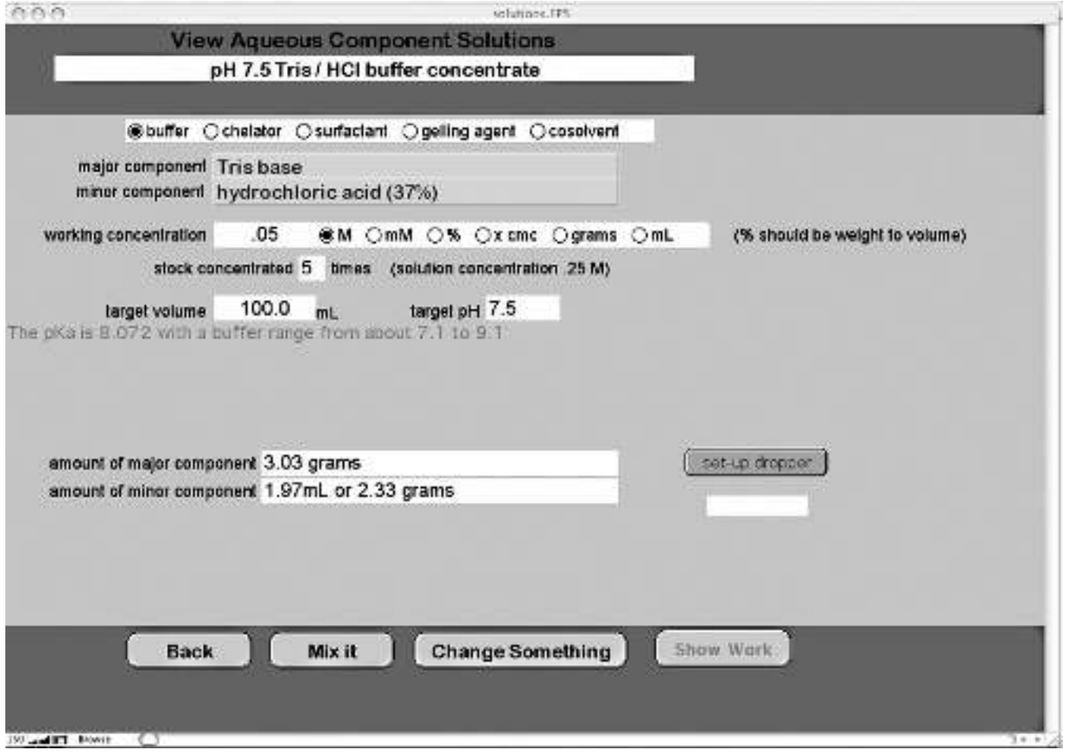


Figure 4. The information on Tris displayed in the "components" database.

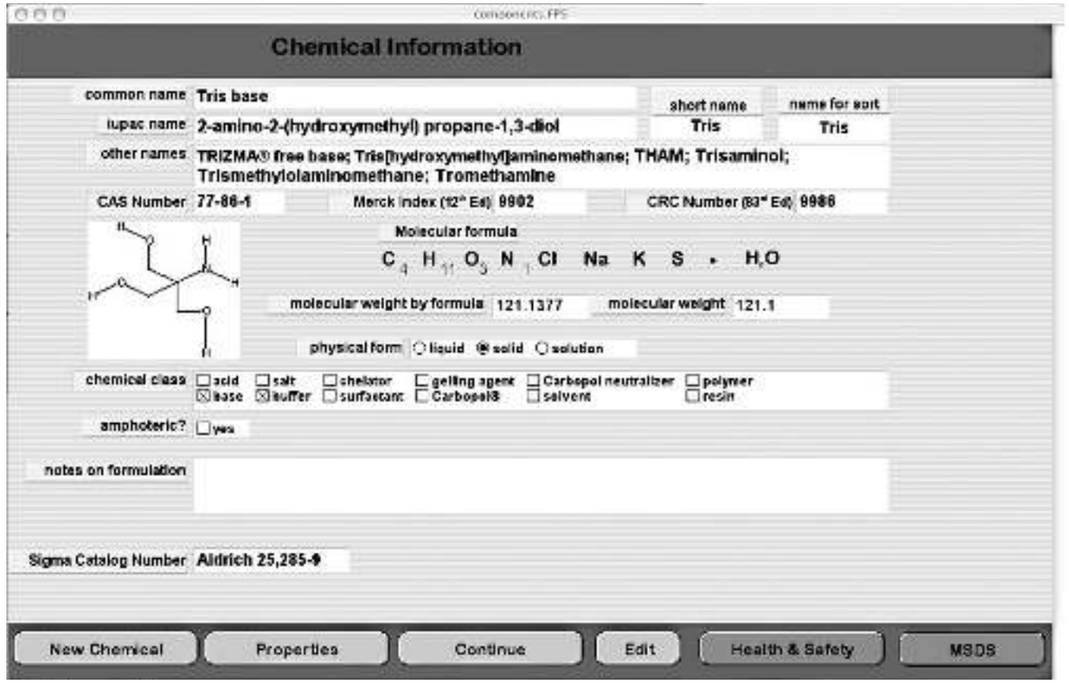
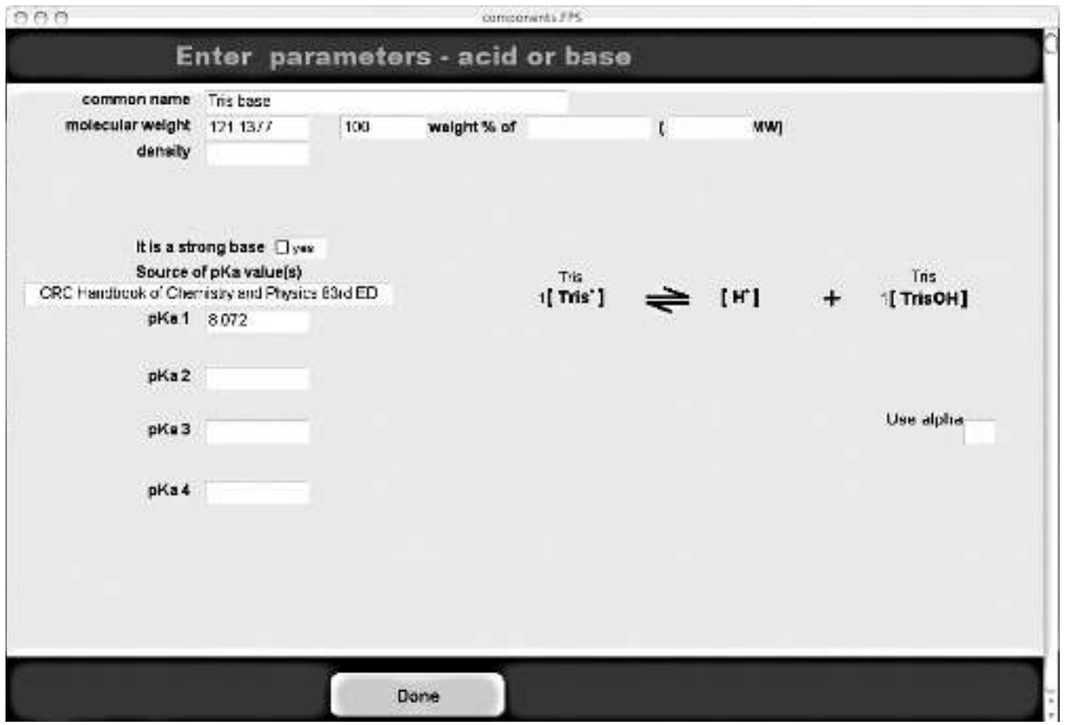


Figure 5. The properties of Tris as displayed in the "components" database.



Clicking on buttons takes the conservator deeper into the database. To return to the previous screens, the conservator need only click on buttons labeled “Back,” “Done,” or “Continue,” depending on the context.

The Modular Cleaning Program is designed for the conservator to modify and extend. Because all of the calculations are based on physical properties, you can integrate a new material into your testing by simply entering it in the components database, adding the required physical properties, building the cleaning solutions, and adding the solutions to an existing solution set or creating a new solution set.

While the inner workings of the database are intricate and complex, using the system is easy and fast. A test cleaning solution can be made in less than a minute from the stock concentrate solutions. It is possible and appropriate to test numerous combinations of the stock concentrate solutions to arrive at the optimum cleaning result.

The Modular Cleaning Program in Use

Case Study I

To demonstrate the cleaning system in use, the surface cleaning of the *Lion* by Jean-Baptiste Oudry (fig. 6) will be described here. The *Lion* (signed and dated 1752), along with eleven other portraits of animals painted by Jean-Baptiste Oudry, was bought by the Duke of Mecklenberg-Schwerin in the mid-eighteenth century and remains in the collection of the Staatliches Museum Schwerin. The *Lion* measures 310 x 256.5 centimeters (122 x 101 inches). There is very little documentation regarding the display and conservation history of this painting. One of the largest paintings in the collection, the *Lion* has been in storage since the mid to late 19th century (Michels 2002). The smaller paintings in the collection appear to have been on display continuously and have thus been part of conservation and restoration campaigns. The painting is being conserved at the Getty Museum in consultation with conservators and curators at the Staatliches Museum Schwerin, Germany. Tiarna Doherty, Assistant Conservator of Paintings at the J. Paul Getty Museum, is cleaning the painting.

Figure 6. The *Lion* by Jean-Baptise Oudry seen on a temporary stretcher in the paintings conservation studio of the J. Paul Getty Museum in 2002.

When examined in 2001, the *Lion* had a very uneven surface due to the effects of aged varnish and a considerable amount of surface grime. It was decided that the approach to cleaning the *Lion* was to be two-fold: surface cleaning would be done before the varnish would be thinned or removed. This meant that the cleaning tests would be narrowly targeted to distinguish between the solubilities of the different layers. After removal of the dirt layer it would be easier to control the thinning or removal of varnish, thus allowing for a slow and balanced aesthetic cleaning.

In the preliminary examination of the painting, water and spit-cleaning tests were performed to see how much dirt could be removed from the surface. While it was evident that the painting was very dirty, little could be removed using water or saliva alone. It was anticipated that surface cleaning would require a modified water-based system. Fortuitously, the treatment of the Oudry painting coincided with the development of the Modular Cleaning Program.

After verifying that the paint and substrate were not adversely affected by water, the surface grime was tested with pH buffered water. Disposable polyethylene pipettes were used to measure the concentrated stock solutions (fig . 7)

Figure 7. Picture of cart with laptop computer and concentrated stock solutions in front of the *Lion*.

Figure 8. Detail of pipettes and measuring cups used with the concentrated stock solutions.

into small, polyethylene “weighing” cups, which were used to hold the test mixtures (fig . 8).

The beginning step was to take 1 mL of distilled water, 1 mL of the concentrated buffer stock solution, and three additional mLs of distilled water and mix them in a numbered weighing cup. Five mLs of test solution are sufficient to evaluate the cleaning potential of the test cleaning solution in a number of areas on a painting.

The surface cleaning tests at pHs 5.5 and 6.5 were not substantially more effective than water alone. Water buffered to pH 7.5 was able to remove some surface grime.

At pHs above 6.5 with citrate chelating agent (in addition to the buffer and a surfactant), some yellow-colored material was observed on the swab. It was surmised that the yellow material was degraded varnish removed from the surface. As the goal of the cleaning was to leave the varnish entirely intact, testing was continued without chelating agents.

Ultimately, water buffered to pH 8.5 with the addition of Triton XL-80N was found to remove the dirt effectively without seeming to disturb the degraded varnish layer. This solution was cleared by rinsing the surface with water buffered to pH 8.5.

The cleaning tests for the Oudry progressed through 35 solutions. There were often subtle differences in both the handling and the cleaning effect of the solutions. An advantage to using the computer to assist in the testing is that it keeps track of the testing progress. By numbering the polyethylene cups to match the tests, and entering the conservator’s observations for each test into the computer, a detailed record of the testing process is produced.

Once the optimal cleaning system is determined one can choose the “Yes: Clean” button, which will calculate the amount of materials in the solution for a specified volume and provide mixing instructions so the conservator can prepare a larger batch of the cleaning solution.

Figure 9. *Portrait of Elisha Caleb Dean*, 1854, by Solomon Nunes Carvalho. Photograph before treatment in specular light showing the uneven, leathery surface.

The Modular Cleaning Program in Use

Case Study II

The treatment of *Portrait of Elisha Caleb Dean*, 1854, by Solomon Nunes Carvalho demonstrates how the Modular Cleaning Program can allow the conservator to find a cleaning solution that otherwise wouldn’t have even been tested. The painting belongs to a private party and was treated by Chris Stavroudis, Conservator in Private Practice.

The Carvalho portrait is an oil (est.) painting on canvas. It is stretched over a wooden panel and measures 11” x 10” (fig. 9). The painting was framed in an oval frame, protecting the corners of the painted surface. It appeared that the painting had never been removed from the frame. While it had been abused, it did not seem to have ever been abused by a conservator. The painting was unvarnished.

The surface of the painting was leathery and uneven. Because it had never been varnished or treated before, it was assumed that the surface grime was strongly adsorbed and that the surface had oxidized to a considerable extent. Therefore, to minimize the risk of dissolving original material, test cleanings were started at a low pH.

Testing with the Modular Cleaning System, buffers alone were not effective (neither was water or “spit cleaning”). Higher pHs were observed to cause blanching. Testing with surfactants

added to buffers was not particularly helpful, although they did remove slightly more grime. This is to be expected. Research on soiling has demonstrated that fresh grime is readily removed by surfactants, but aged grime requires a chelating agent (Wolbers 1992; Phenix & Burnstock 1992).

Tests with citrate as a chelating agent (along with the buffer and surfactant) were found to work much better, but left the surface dull and cloudy. Upon Richard Wolbers' recommendations for the original "logic tree," an EDTA stock solution had been incorporated into the stock solution set. The conservator was unfamiliar with cleaning with EDTA and presumed it to be too strong a chelating agent to use on a painted surface, however tested it nonetheless. When applied to a small area, the recovered surface was beautiful.

The painting was cleaned with a solution mixed from the Modular Cleaning System – pH 5.5 (MES buffer) with Brij 700 and 0.05M EDTA and a small amount of HPMC to thicken the solution slightly. It was cleared with carbonated distilled water (acidic itself), and the whole surface was rolled with xylene. Establishing the optimum cleaning solution required the mixing of 12 test solutions, taking perhaps 20 minutes.

The recovered surface was almost presentable as it was, although it was a bit dry and under-saturated. In this case, the unexposed corners of the painting were a reference to the degree of saturation appropriate for the painting. The surface was lightly misted with a tiny amount of dammar varnish, which was brushed out with a dry brush (fig. 10).

Figure 10. Carvalho painting after treatment installed in its original oval-matted frame.

Conclusion

The Modular Cleaning System and the use of concentrated stock solutions allows the conservator to test a large range of cleaning solutions in a short period of time. By testing far more cleaning options than can normally be mixed and tested, the conservator can continue to move toward more delicate and sensitive cleanings. The database and the design of the modular concentrated stock solutions allow the conservator to concentrate on the aesthetics of a cleaning rather than on the mechanics of mixing cleaning solutions.

The Modular Cleaning Program calculates the formulations of both the concentrated stock solutions and the test cleaning solutions based on physical constants. This brings a rationality to the cleaning of works of art that historically was based on an almost ritual reliance on formulas. The availability of physical constants with references to their sources as well as health and safety information just a few mouse clicks away saves the conservator numerous trips to reference books.

Once the conservator has prepared the concentrated stock solutions they may be kept at-hand in the studio. Nearly all have excellent shelf lives and since such small volumes are used for testing, the set will last for a good number of test cleanings. For smaller works of art, the final cleaning solution can actually be made from the concentrates. The entire testing process minimizes waste.

By allowing conservators to correlate the effectiveness of a cleaning with the modular components, the Program reinforces the understanding of modern cleaning theory. The system may also find application in conservation training programs.

The Modular Cleaning System is evolving. In the planning for future versions are:

- A discussion of test solution clearance (rinsing) and recommendations for clearance of each test solution.
- The ability to use two surfactants in the same test solution.
- The ability to add co-solvents, small amounts of organic solvents that extend the capabilities of an aqueous cleaning system.
- The ability to add ionic strength buffers.
- The ability to add metal ion buffers to minimize solubilization of desirable metal ions from the substrate.
- A comprehensive help system.

The system has some problems and limitations:

- It will never adequately handle emulsion based cleaning systems.
- FileMaker Pro does not support extremely complex mathematics or the generation of dynamic charts or graphs.

And a final limitation, The Modular Cleaning System is a tool to assist conservators in their decision making. Computers cannot clean works of art. A database will never replace the intelligence and "eye" of the conservator.

The Modular Cleaning System is being distributed to professional conservators and may be downloaded from CoOL (Conservation On Line) at http://palimpsest.stanford.edu/byauth/stavroudis/mcp/. There are versions of the software for Windows and Macintosh operating systems. The 19 interrelated databases can be downloaded by conservators who already own FileMaker Pro (version 5.0 through version 6.0). Conservators who do not own FileMaker can download the databases bundled with a runtime version of FileMaker Pro. There are runtime versions for Macintosh System 9, Macintosh OS-X, and Windows 98 and higher.

To prevent its use by amateurs, the Modular Cleaning Program requires a serial number before it can be opened for the first time. Professional conservators may register with Chris Stavroudis to obtain a serial number. Registered users will also be notified when updated versions of the software is available.

Please note: No technical support will be provided. The software is under copyright and may not be sold or distributed. Modifications made by other parties must be shared with the user community.

Acknowledgements

We would like to thank Mark Leonard, Head of Paintings Conservation at the J. Paul Getty Museum, for his support of this project.

References

www.surface.akzonobelusa.com/(accessed July 26, 2004).

Barov, Z.1990. Removal of inorganic deposits from Egyptian painted wooden objects. In *Cleaning, Retouching and Coatings*, ed. Mills, J.S., and Smith, P., London: International Institute for Conservation of Historic and Artistic Works. 19–22.

Bellucci, R., Cremonesi, P., and Pignagnoli, G. 1999. A Preliminary Note on the Use of Enzymes in Conservation: The Removal of Aged Acrylic Resin Coatings with Lipase, *Studies in Conservation* 44: 278 – 281.

Budavari, S. ed. 1989. *The Merck Index: An Encyclopedia of Chemicals, Drugs, and Biologicals, 12th Edition*. Whitehouse Station: Merck & Co.

Burnstock, A. and White, R. 1990. The Effects of Selected Solvents and Soaps on a Simulated Canvas Painting. In *Cleaning, Retouching and Coatings*, ed. Mills, J.S., and Smith, P., London: International Institute for Conservation of Historic and Artistic Works. 111-118.

Caley, T. 1990. Aspects of Varnishes and the Cleaning of Oil Paintings Before 1700. In *Cleaning, Retouching and Coatings*, ed. Mills, J.S., and Smith, P., London: International Institute for Conservation of Historic and Artistic Works. 70-72.

Carlyle, L., Townsend, J.H., and Hackney, S. 1990. Triammonium Citrate: an Investigation into its Application for Surface Cleaning in *Dirt and Pictures Separated*, ed. Hackney, S., Townsend, J., and Eastaugh, N. London: United Kingdom Institute for Conservation. 44-48.

The Conservation Unit of the Museums and Galleries Commission.1996. *Science for Conservators. Vol. II: Cleaning*. London: Butler and Tanner Ld.

Cremonesi, P., and Bortolotti, I. 1999. Un approccio più scientifico alla pulitura dei dipinti. Triansol ®: il Triangolo delle solubilità, un software per il restauro. *Progetto Restauro*, 10: 42–45.

Dorge, V. ed. 2004. *Solvent Gels for the Cleaning of Works of Art*. Los Angeles: Getty Publications.

Freiser, H. 1992. *Concepts & Calculations in Analytical Chemistry: A Spreadsheet Approach*. Boca Raton: CRC Press.

Freiser, H. and Fernando, Q. 1963. *Ionic Equilibria in Analytical Chemistry*. New York: John Wiley & Sons.

Hackney, S., Townsend, J., and Eastaugh, N. 1990 in *Dirt and Pictures Separated*. London: United Kingdom Institute for Conservation.

Harris, D.C. 2003. *Quantitative Chemical Analysis. 6th Edition*. New York: W. H. Freeman and Company.

Henry, W. 1995. Application Development for the Conservation Laboratory. In *Advances in Preservation and Access, Vol. II*. ed. Higginbotham, B.B. Medford, N.J.: Learned Information, Inc. 56–179.

Huibers, P.D.T. 1996. Surfactant Self-Assembly, Kinetics and Thermodynamics of Micellar and Microemulsion Systems. Ph.D. Thesis. University of Florida. htpp://surfactants.net/thesis/index.html(accessed July 26, 2004).

International Institute of Intellectual Co-operation. [1940] 1997. *Manual on the Conservation of Paintings*. Reprint, London: Archetype Publications.

Keck, C. 1978. *How to Take Care of Your Paintings*. New York: Charles Scribner's Sons.

Khandekar, N., Dorge, V., Khanjian, H., Stulik, D., and de Tagle, A. 2002. Detection of residues on the surfaces of objects previously treated with aqueous solvent gels. In *ICOM-CC 13th Triennial meeting Rio de Janeiro*. 352-359.

Khanjian, H., Dorge, V., de Tagle, A., Maish, J., Considine, B., Miller, D., and Khandekar, N. 2002. Scientific investigation of surface cleaning processes: quantitative study of gel residue on porous and topographically complex surfaces. In *ICOM-CC 13th Triennial meeting Rio de Janeiro*. 245–251.

Lide, D. R. ed. 2002. *CRC Handbook of Chemistry and Physics, 83rd Edition* Boca Raton: CRC Press.

McCutcheon's, Volume 1: Emulsifiers & Detergents, North American Edition, 2003. Glen Rock, NJ : Manufacturing Confectioner Publishing, McCutcheon's Division.

Michels, J. 2002. Personal communication. Staatliches Museum, Schwerin, Germany.

Mora, P., Mora, L., and Philippot. P. 1984. *Conservation of Wall Paintings*. London: Butterworths.

Ormsby, M. 2001. Solvent Solver Program. *American Institute for Conservation News*. 26 (5): 6.

Phenix, A. and Burnstock, A. 1992.The removal of surface dirt on paintings with chelating agents. *The Conservator* 16: 28-38.

Plenderleith, H.J. 1956. *The Conservation of Antiquities and Works of Art*. London: Oxford University Press.

Ramer, B. 1979. The Technological Examination and Conservation of the Fayum Portraits in the Petrie Museum. *Studies in Conservation*, 24:1-13.

Rothe, A. 2002. Personal communication. Paintings Conservation Department, J. Paul Getty Museum, Los Angeles, CA.

Ruhemann, H. 1968. *The Cleaning of Paintings*. New York: Frederick A. Praeger, Publishers.

Weast, R.C. ed. 1972. *CRC Handbook of Chemistry and Physics, 53rd Edition*. Cleveland: The Chemical Rubber Co.

Wolbers, R. 1988. Notes for Workshop on New Methods in the Cleaning of Paintings. Unpublished manuscript. The Getty Conservation Institute, Los Angeles.

Wolbers, R. 1992. The use of a synthetic soiling mixture as a means for evaluating the efficacy of aqueous cleaning materials on painted surfaces. *Conservation-Restauration Des Biens Culturels*. 4: 22-29.

Wolbers, R. 2002. *Cleaning Painted Surfaces: Aqueous Methods*. London: Archetype Publications.

Sources of Materials

Software:

FileMaker® Pro Developer 5.5 and FileMaker® Pro 6.0
FileMaker, Inc.
5201 Patrick Henry Dr.
Santa Clara, CA 95054
(408) 987-7000

Supplies:

Disposable Polyethylene Pipette (1/2 mL. graduation. 3 mL draw. 7 mL Capacity)

Weighing Cups (Polyethylene, graduated. Total capacity is 30cc)

Chemicals frequently used in stock solution sets (acids, bases, buffers, chelating agents, co-solvents, surfactants):

Sigma catalog:

Bicine (N,N-bis[2-Hydroxyethyl]glycine) catalog: B-3876

Bis-tris (bis(2-hydroxyethyl)amino-tris [hydroxymethyl] methane) catalog: B-9754

Glycine (aminoacetic acid) catalog: G-7126

HPMC (hydroxypropylmethylcellulose) catalog: H-7509

MES (2-[N-Morpholino]ethanesulfonic acid monohydrate) catalog: M-3671

sodium lauryl sulfate (sodium dodecyl sulfate) catalog: L-5750

Aldrich catalog:

Brij® 700 (POE 100 Stearyl ether) catalog: 46,638-7

DTPA (Diethylenetriamine pentaacetic acid) catalog: D9,390-2

EDTA (ethylenediaminetetraacetic acid) catalog: 25,404-5

Tris (Tris[hydroxymethyl]aminomethane) catalog: 25,285-9

Sigma-Aldrich
3050 Spruce St.
St. Louis, MO 63103
(800) 325-3010

Acetic acid
Ammonium hydroxide
Benzyl alcohol
Citric acid (2-Hydroxy-1,2,3-propanetricarboxylic acid)
Hydrochloric acid
Sodium hydroxide
Carbopol® 934
Deoxycholic acid
n-Methyl-2-pyrrolidone
Triton® XL-80N

Conservation Support Systems
Santa Barbara, CA
(800) 482-6299

This material was first published in the AIC Paintings Specialty Group Postprints v.17, 2005. Reprinted here with permission.

Articles You May Have Missed

Susanne Friend, column editor

"Proposed California Arts Budget Lowest Per-Capita In US," *Los Angeles Times*, 01/12/05

The California Arts Council has a new director - Muriel Johnson, a veteran Republican politician and arts advocate from Sacramento. But she won't have much to work with. The $3.2-million arts budget governor Arnold Schwarzenegger proposed Monday means that California again will likely rank last in the nation in per-capita state spending on the arts.

"Weak Dollar Sending Art Back Across The Atlantic," *The Guardian* (UK), 01/29/05

The American dollar's slide against other currencies has apparently sparked a push by European art institutions to reacquire some of the countless works which had been bought up by American collectors over the decades. The weak dollar offers European buyers some remarkable bargains. At Sotheby's Old Masters sale in New York, a Botticelli sold for the equivalent of £246,000. Sources said Italians were particularly active buyers. Italy having produced so much good art, there are plenty of works for Italians to repatriate.

"The Art Of Costco (Literally)," *Philadelphia Inquirer,* 01/23/05

What's so strange about buying a Picasso at Costco? They have an excellent return policy. By visiting costco.com and searching under 'fine art,' buyers can access a list of artworks for sale by Marc Chagall, Amadeo Modigliani, Henri Matisse, Georges Braque, and others. On Wednesday, prices on the ever-changing list ranged from $21.49 to about $1,500, for a limited-edition lithograph. With a click of the mouse, you can add art to your cart.

"Still Searching For Kuwait's Art," *The Telegraph,* (UK) 01/10/05

Where did the art stolen by Iraq from Kuwait during the Gulf War in 1990-91 go? Although most of the collection looted from Kuwait's National Museum has been recovered, almost all the jewelry, Islamic art, and other works taken from wealthy Kuwaitis by the Iraqis during the six-month occupation has vanished. Only a few pieces have surfaced on the art market, and none of it was found in Iraq.

"Small Endowment - Why David Has A Small..." *The Age* (Melbourne), 01/26/05

As every visitor to Florence will know, the modest dimensions of David's "pisello" are a running joke with Italians, and the stuff of irreverent postcards. But, in a paper to be published at the end of this month, two Florentine doctors offer a scientific explanation: the poor chap was shriveled by the threat of mortal danger. Michelangelo's intention was to depict David as he confronted Goliath.

" 'Wall Of Air' To Protect David?," *BBC,* 01/04/05

Officials in Florence are considering installing machinery that would envelope Michelangelo's David in a constant stream of air. The "wall of air" is one of several steps the museum is considering that could protect the statue from dirt particles without encasing it in glass. More than a million tourists are said to visit the statue every year in the Italian city of Florence.

"Uncovering Nero's Roman House," *MSNBC.com,* 01/19/05

When Nero's Rome fell, his palace in the middle of the city was buried. This week, almost 2,000 years after Nero's rule, Rome city officials unveiled a new find from the palace that offers a tantalizing hint of the treasures buried beneath the hill. It is a large mosaic, more than 9 by 6 feet, showing naked men harvesting grapes and making wine, a typical illustration for a Roman palace of the time.

"A Find: Leonardo's Studio," *The Independent,* (UK) 01/12/05

Researchers have discovered the hidden laboratory used by Leonardo da Vinci for studies of flight and other pioneering scientific work in previously sealed rooms at a monastery next to the Basilica of the Santissima Annunziata, in the heart of Florence.

"Russia To Consider Returning Dresden Collections," *St. Petersburg Times* (Russia), 01/18/05

Russian president Vladimir Putin seems to have opened the door to negotiating the return of German artwork looted by Soviet troops at the conclusion of World War II. Putin said that an exhibition in Russia of art that has been returned to Germany, including Raphael's *Sistine Madonna* from Dresden's State Art Collection, as has been proposed by Lidia Levleva, director of the Tretyakov Gallery, could be held. Such an exhibition would create an atmosphere that could allow further progress on the matter of trophy art.

"Frankfurt Garbage Collectors Destroy Artwork," *The Guardian* (UK), 01/13/05

Frankfurt sanitation workers mistakenly removed and destroyed some yellow plastic sheets on the street that were part of an art installation. Thirty of the dustmen are now being sent to modern art classes to try to ensure that the same mistake never happens again. The head of Frankfurt's sanitation department, Peter Postleb, took responsibility for the destruction of the sculpture, saying that confusing the plastic sheets with rubbish was an easy mistake to make. He thought they were abandoned building materials.

"Physicist: Hockney Theory Is Wrong," *The Scotsman,* 01/13/05

A California physicist says he has proof that David Hockney's controversial theory that Renaissance artists traced their work is wrong. David Stork used computer imaging of a 1645 painting, *Christ in the Carpenter's Studio*, by Georges de la Tour, to show that the only source of light in the work was a candle shown in Christ's hand. It means the image could not have been projected, he said.

"Louvre, Pompidou To Open Branches," *The New York Times,* 01/10/05

Two big French museums are opening satellite branches. The Louvre is to open a $100 million satellite in the northern French city of Lens, near Lille, in 2009 and will occupy a new annex at the High Museum of Art in Atlanta for three years from 2006. Still, the Louvre's director, Henri Loyrette, has said he considers Britain's Tate to be a closer role model than the Guggenheim. The Tate, founded a century ago on London's Millbank, now runs three other museums in Britain, but it has no permanent presence abroad. In contrast, while the Pompidou will inaugurate a new $68 million branch in the northeastern French city of Metz in 2007, it is also looking beyond France.

"Look Out Art, Mama's Got An Ax! (Her Day In Court)," *The Guardian,* (UK) 01/07/05

The mother of Europe's most prolific art thief was in court in France Thursday, charged with throwing away art her son had stolen. When Mireille Breitwieser, a former nurse, found out that her son Stephane, 33, had been arrested on suspicion of stealing paintings worth tens of millions of pounds from museums across Europe, she rushed into his bedroom and started chopping up all the canvases she found there, prosecutors said yesterday.

"Workers Destroy Section Of China's Great Wall," *News.com.au* 02/12/05

Construction workers destroyed a large section of the Great Wall of China recently. Almost 100m of the wall in northern Ningxia autonomous region was leveled in two overnight raids by construction workers who used the material to pave a road. The destroyed area near Zhongwei city was constructed during the Ming Dynasty (1368-1644) in an region known as the Great Wall Museum because of the profusion of rammed earth sections of the wall.

"Angkor Looting Increases," *The New York Times,* 03/21/05

Looting at Angkor Wat has increased in the past six months. One of the astonishing aspects of the Angkor sites is their diminished nature at the hand of modern man. Amid the grandeur, empty pedestals, headless carvings, and missing lintels cast an aura of indelible loss. The sudden cascade of tourists - one million foreign visitors came to Cambodia last year, a vast majority to Angkor - brings many risks: overcrowding, dwindling of the scant local water supply, a cheapening atmosphere.

"The EU's Resale Madness," *The Guardian,* (UK) 01/03/05

A proposed levy in the European Union would grant a resale tax on every resold piece of art. The measure will give artists, and their descendants for 70 years after their deaths, claims upon a levy imposed every time one of their works is resold. Very fair, some will say. Yet in practice, it will simply cause owners of contemporary art to send works for sale in markets where the levy is not applied, notably Switzerland and the US.

"Art Of The Moment (After The Moment Has Passed)," *The New York Times,* 01/02/05

Art made from obviously impermanent materials that is being painstakingly preserved; art made to stay shiny and new that is being treasured for its age; art challenging the notion of originality that is being scrutinized for that quality; once-standard, off-the-shelf materials that are now hard to find; collectors who cling to a piece of paper that proves their dated light fixture is worthy of a museum, not a recycling bin; and caretakers of a reputation who make decisions that they readily admit run counter to the artist's original intentions. Such is the strange afterlife of work that produces beauty from the banal, an object lesson in how the legacy of a strong-willed radical can be brought to heel by an even stronger force, the market.

"Hirst's Shark Deteriorating," *The Art Newspaper,* 02/04/05

Damien Hirst's shark floating in a tank of formaldehyde was recently sold for $12 million. But the shark has deteriorated noticeably to the naked eye since it was first unveiled at the Saatchi Gallery in 1992. The formaldehyde solution in which it is suspended is murky while the skin of the animal is showing signs of wear and tear.

"Shark Pickler Hirst Admits to Silly Ideas," *Reuters, 3/29/05*

The artist best known for pickling a shark and slicing up a cow admits he has had some pretty silly ideas over the years. Damien Hirst, the ageing enfant terrible of the British art world, is optimistic that museums will still be showing at least some of his work in 200 years time.

"You do turn round after a few years and look at your stuff and you think it's embarrassing," Hirst said in an interview at New York's Gagosian gallery, where his latest work is on show in an exhibition called *The Elusive Truth*. "Certainly everything you make is not a masterpiece.Some of my spin paintings I think are a bit silly. The cut in half pig that moves like a bacon slicer I suppose I thought was a bit silly in retrospect."

He stands by his most famous work, a shark preserved in formaldehyde and titled *The Physical Impossibility of Death In The Mind Of Someone Living*. "I think the shark's obviously an important piece," he said, brushing off reports that it is disintegrating. "I think it just needs a bit of love and attention."

"A Big Business In Stolen Religious Art," *Los Angeles Times,* 01/02/05

Stolen religious art is big business in Mexico and all over Latin America. Churches, convents, and shrines all over Latin America are under siege. The Immigration and Customs Enforcement Agency in Washington and the FBI, which will soon unveil a "rapid response" task force to fight trafficking in smuggled art, say they are beefing up enforcement efforts. A key tactic is monitoring the Internet, where much of the loot is sold.

"Art For Your TV," *ABCNews.com*, 01/04/05

Flat screen high-definition TVs are becoming popular. But there still isn't a lot of programming to take advantage of the screens. So one company is introducing the GalleryPlayer. It will allow subscribers to purchase and display high-resolution digital images of "museum-quality" art and photos on their high-definition digital TV displays.

"Plundering Iraq," *The New York Times,* 02/14/05

Tens of thousands of objects have just gone completely missing from Iraq in the past two years. It's a cultural disaster of massive proportions. A senior counter-terrorism official said the trade in illicit antiquities was increasingly run by organized rings of professional thieves, who use poor Iraqis in rural areas as diggers. Objects are funneled out of the country in concealed shipments along smuggling routes that have been plied for centuries, in a system in which artifacts are sold for cash or sometimes for weapons that wind up in the hands of insurgents in Iraq. Some archaeological experts estimate that the illegal antiquities trade may pump tens of millions of dollars into the underground economy in Iraq.

"Hidden City's Remains Uncovered By Tsunami," *BBC,* 02/13/05

Parts of a long-lost port city in India were uncovered by last year's tsunami. Archaeologists say they have discovered some stone remains from the coast close to India's famous beach

front Mahabalipuram temple in Tamil Nadu state following the 26 December tsunami. They believe that the "structures" could be the remains of an ancient and once-flourishing port city in the area housing the famous 1200-year-old rock-hewn temple.

"Will Henry Moore Arch Ever See The Light Of Day Again?," *The Guardian* (UK,) 03/06/05

What happened to the grand marble arch created by sculptor Henry Moore that used to reside in London's Kensington Garden's area? A note in the guidebook *Buildings and Monuments in the Royal Parks* says that the Arch (as the sculpture is officially called) has been "temporarily removed and dismantled for repair." But it has been broken up for nearly a decade. Nor is there much prospect that this grand piece, made in 1980 by Britain's most famous sculptor for the people of London, will be repaired - or indeed seen by the public again.

"Billionaire To Restore Henry Moore," *The Guardian* (UK), 03/22/05

A billionaire art collector has offered to pay for the restoration of a Henry Moore marble arch. The six-meter tall work, given by Moore in 1980 to the people of London, was removed from Kensington Gardens and dismantled in 1996 on safety grounds. The sculpture is unevenly weighted, and soon after it was installed it began to twist. In addition, travertine, the stone of which it is made, is susceptible to damaging cycles of freeze-thaw in cold weather. The Royal Parks, which manage Kensington Gardens, have estimated that to repair it - by inserting a steel "spine" - would cost around £300,000, which they say they cannot afford.

"Is Pollution Hurting Terra-Cotta Warriors?," *China View,* 03/03/05

American scientists are collaborating with Chinese counterparts to study the effects of pollution on the terra-cotta warriors in Xian. Based on continuous observation of the pollution and studies on the change and chemical reaction mechanism of corrosive gas, aerated solids, and dust, researchers will work out an evaluation report on the mechanism of pollutants' corrosion on the rare cultural relics.

"British Government Knew Queen's Benin Bronze Had Been 'Expropriated'," *The Art Newspaper,* 02/16/05

The British Foreign Office knew back in the 1970s that a Benin bronze head given to the Queen by Benin's president had been "expropriated" from the Lagos Museum. The bronze which Gowon gave to the Queen on his [1973] state visit was a sixteenth century piece worth up to £30,000 on the market. It was in the Lagos Museum up to a few days before Gowon left for the UK when, realizing he had to come bearing a suitable gift, he sent to the Museum and said "I'll have that one."

"Scots Plea For Architectural Mercy Killing," *The Times* (UK), 02/21/05

When the makers of a new Channel 4 series on Britain's ugliest buildings invited viewers to nominate the eyesore they would most like to see demolished, they were hardly prepared for a request to flatten an entire town. But civic pride appears to be truly dead and buried in Cumbernauld, a 1950s creation that is home to 52,000 souls 15 miles northeast of Glasgow. Its residents were among the first to contact the program, begging for dynamite and bulldozer to deliver them oblivion. The town's design won architectural awards in the brutalist-besotted 1970s, but the 2003 *Idler's Book of Crap Towns* called Cumbernauld the second-worst place to live in the UK.

"Gehry's LA Concert Hall To Get A Bit Duller," *Newsday,* (AP) 03/02/05

Los Angeles's glittering jewel of a concert hall, as designed by Frank Gehry, seems to be glittering a bit too much. Disney Hall will undergo a $90,000 exterior renovation this spring to dull the sheen on a convex section of the building's reflective outer walls, following extensive complaints from pedestrians and nearby residents about sun glare and excessive heat.

"Critics: Conservators Ruined Gaudi Chapel," *The Art Newspaper,* 03/05/05

Architects and conservators say the Spanish government has caused irreparable damage to the Catalan architect's Güell crypt. They describe the cleaning of the building as "brutal" and say that it was carried out with abrasive materials abandoned years ago by the conservation industry. They also say that a staircase which provided access to the roof has been removed, and they say that the restorers have placed a large stone plinth commemorating their restoration inside the chapel. This distracts visitors and disrupts the circulation within the chapel intended by Gaudí. The restorers also cut down an old pine tree near the building, which Gaudí had deliberately left standing and which he had incorporated in his design for the chapel.

"Arrests In Munch Theft," *The New York Times,* 03/08/05

Nine arrests have been made in Oslo in the weekend theft of three Edvard Munch artworks. A car chase ended when a police vehicle smashed into a vehicle in which the suspects were fleeing. The artworks were apparently found in a building in Oslo's Kampen neighborhood, less than a mile from the Munch Museum, from which armed robbers took one of the two painted versions of *The Scream* - the other is in the National Gallery of Norway - and another Munch masterpiece, *Madonna*, on Aug. 22.

"CT: Tut Not Murdered," *Discovery,* 03/08/05

King Tutankhamun was not murdered, but may have suffered a bad broken leg shortly before his death at the age of about 19, a CT scan on the 3,300-year-old mummified body of the pharaoh has revealed.

"Michelangelo's Self-Portrait?," *Discovery,* 03/21/05

Historians in Florence believe they have found a sculpted marble relief of Michelangelo that might have been carved by the artist himself. The work speaks for itself: it is a very high-quality sculpture which depicts Michelangelo. The skilled chiseling on the back makes them think it might be a self portrait.

"Pompidou Picasso Recovered," *BBC,* 04/08/05

A Picasso painting stolen last year from the Pompidou, has been recovered. Following a tip-off, police traced the painting - worth 2.5m euros - to a house in Paris where the painting was hidden behind a wardrobe. Cubist painting *Nature Morte a la Charlotte*, completed in 1924, was reported missing in May last year from a restoration workshop.

"Expert: "Fake" Cezanne Is Real," *News.com.au,* 03/23/05

An expert says a painting recently declared a fake is in fact a real Cezanne. He based his assessment on the unsigned work, purported to have been painted by Paul Cezanne, being riddled with secret "signatures" left behind by the renowned French impressionist. The piece, *Son in a High Chair*, was among notable works said to have been taken from the home of eccentric NSW art restorer John Opit in February last year.

"The Drama Of Authentication," *Boston Globe,* 03/30/05

A new play running in Boston focuses on what outsiders might consider an unlikely profession when it comes to the creation of dramatic sparks: art authentication. Of course, the play isn't exactly an accurate depiction of the authentication business, any more than archeologists' lives resemble that of Indiana Jones, but the production does call attention to a little-known, but vitally important, corner of the art world, and sheds some light on the rivalries and internal politics that can affect it.

"Mona Lisa Takes A Holiday (What Will The Tourists Say?)," *Pittsburgh Post-Gazette* (WSJ), 03/25/05

The room at the Louvre that is home to the Mona Lisa is to be renovated, and for the first time in three decades, the painting will skip a day on show. Now she is having her room renovated, to handle an average of more than 1,500 visitors an hour. She'll be off display for one day on April 4 while curators install her in the upgraded digs. The Louvre fears irate crowds if Japanese and American visitors turn up to find an apology hanging from Lisa's empty spot on the wall. While Rembrandts, Titians, and El Grecos can all spend weeks in restoration, under study, or on tour, the Mona Lisa has always remained on display.

"Storing Art Out In Public," *CNN.com,* 03/28/05

The Brooklyn Museum's Luce Center for American Art is among a growing number of visible storage centers in the world. Art experts say visible storage is a good option for museums to show the public the breadth of a specific collection, but they caution that it must be used to complement, not to replace, traditional exhibits. At the Brooklyn Museum, about 800 objects are housed in the Luce Center, including all American paintings previously not on display. There are thousands more decorative objects, such as spoons, teapots, and toasters, still in storage.

"LA County Museum Director's Resignation A Surprise," *Los Angeles Times,* 04/04/05

Longtime director Andrea Rich's announcement was unexpected. Her resignation comes just weeks after the museum announced that $156 million had been raised for an ambitious expansion and renovation, enough for construction to begin by year's end on the first round of architect Renzo Piano's plans for the Wilshire Boulevard facilities. That announcement marked a major turning point for the museum, which had to abandon an earlier, more sweeping plan for the museum complex after failing to raise enough money.

"US Scientists Fight Legislation That Would Restrict Kennewick Man Study," *Newsday,* 04/11/05

Scientists are opposing a bill in the US Congress that would allow federally recognized tribes to claim ancient remains even if they cannot prove a link to a current tribe. That could block study of the ancient Kennewick man. Scientists fear that the bill, if enacted, could end up overturning a federal appeals court ruling that allows them to study the 9,300-year-old skeleton, one of the oldest ever found in North America. The skeleton was discovered in 1996 along the Columbia River near Kennewick, Wash., and has been the focus of a bitter nine-year fight.

"Peru's Emergency Plan For Machu Picchu," *The Guardian*, 04/15/05

The Peruvian government has come up with an emergency rescue plan to save the ruins of Machu Picchu from erosion and tourists. The $132.5m plan is to be studied by Unesco and the World Bank at a three-day meeting in Lima beginning on Saturday. Machu Picchu is the most visited archaeological site in Latin America. It has been a Unesco world heritage site since 1983, but the UN's cultural organization made it clear last year that if something were not done soon it would be put on the list of sites at risk.

"Vatican's Ancient Laocoon - A Forgery?" *The New York Times,* 04/18/05

A scholar has suggested that *Laocoön*, a fabled sculpture whose unearthing in 1506 has deeply influenced thinking about the ancient Greeks and the nature of the visual arts, may well be a Renaissance forgery - possibly by Michelangelo himself.

"Moscow Treasure Reopens After Fire," *The New York Times,* 04/19/05

A major architectural treasure has reopened a year after a damaging fire. Built in just six months in 1817 under the orders of Czar Alexander I for the fifth anniversary of Russia's victory over Napoleon, Manege was considered architecturally unique from the start. Its recognizable neo-classical yellow facades and majestic white pillars were designed by the Russian architect Ossip Bovet, while its 150-foot-wide interior and triangular wooden roof were created by the French engineer Augustin Bétancourt. This hall could hold a regiment of 2,000 in addition to visitors and audiences. It was said to be the largest uncolumned interior space in the world.

"Spice up the Drive," *The Los Angeles Times,* 5/2/05

Next time you're faced with a long drive, you might want to bring some gum or a minty air freshener. New research shows that the smell of peppermint or cinnamon can significantly improve alertness and performance. Bryan Raudenbush, a psychophysiologist at Wheeling Jesuit University in West Virginia had previously shown that peppermint and cinnamon scents can enhance alertness. To see if they could also help tired drivers, he put 25 students through a two hour simulated driving course while they smelled cinnamon, peppermint, or nothing at all.

He found that both smells improved performance on the driving test, as well as the mental state of the driver. Cinnamon and peppermint increased alertness and decreased frustration, and peppermint also decreased anxiety and fatigue. Raudenbush says peppermint activates an area of the brain that regulates alertness and sleepiness. The research was presented at a recent meeting of the Association for Chemical Reception Sciences in Sarasota, Fla.