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An online magazine dedicated to the interactions between the arts, sciences and consciousness.

Matter and Time

Cheryl Salters
February 2024
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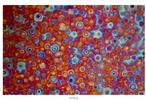
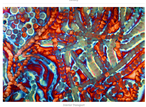
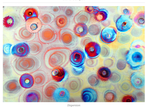
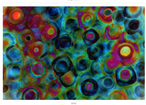
Cheryl Salters, a New York-based artist, explores chemical reactions in the creation of her artworks. Changing colour through reaction, crystallisation, fusing, and solidification are a few of the ways chemistry informs her art. Her science art has appeared in National Geographic and Nature. She has been featured in Forbes and Discover Magazine. She was also a guest speaker at an American Chemical Society conference held in Boston in May 2024 and won the Keynote speaker at Junior Science Symposium held at Albright University.

My chemistry on copper artwork is both inspired by chemistry and employs chemical reactions in its creation. Conceptualizing the atomic scale interactions underlying chemical reactions requires the mind to imagine that which is not present. Chemistry is the study of matter and how chemical matter requires chemists to hold multiple abstract concepts simultaneously and rearrange them to create something new. My art is inspired by these mirrored abstractions of physical, unseeable, matter and the chemical reactions used to depict it. Chemistry and art both find creative solutions to novel circumstances.


Matter and Time

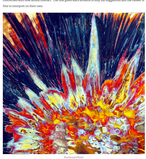

Matter and Time detail


Impression


Flow

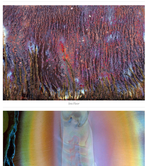
Crying

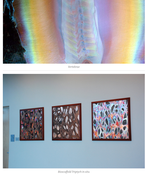
The first five images were born, literally, Interior Transport, Expansion, Ions, and Energy: drawn as abstract interpretations of molecular dynamics. Vibrating, spinning, or zooming from place to place, chemistry is concerned with how atoms interact. The title given each artwork is only my suggestion as to the interest it has to interpret on those days.

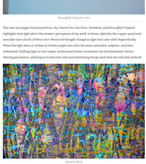

Interior Transport

Ions

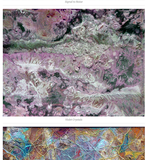
Energy

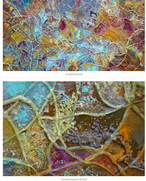

Sea Floor


Incidence

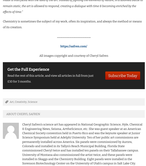

Rhino@Virginia Tech Lake

The next six images fluctuate between, Sky, Prairie Fire, Sea Floor, Incidence, and Rhino@VT Project. It highlights how light alters the viewer's perception of our world. In Event, light hits the copper panel and cascades into a burst of lines color. Mood and thought change as light and color shift dispositionally. Where the light dims or strikes at certain angles the color becomes saturated, majestic, and even ornamental. Nothing light on the copper surface and viewer environments are the heartbeat. Some, depending on perception, allowing me to discover new art and new thing to pursue as the new artist I'm now.


Event


Sky and Prairie Fire

Sky and Prairie Fire detail


Sky and Prairie Fire detail

Sky and Prairie Fire detail

Up to this point the copper panels viewed in this article have been enabled to present further chemical reactions and continuing perturbation. Public art agencies and other patrons of my art need seriousness that these irregular panels will not change with time, and I have consulted with them before.

However, Agua la Nieve, Violin Crystals, and Concentrated Sun scene examples of art I have not availed, and they continue to change with time providing rich extensions to the overall surface. In addition to mineral colors, my process is informed by how decades of agronomic/soil science, geochemistry, geomorphology, images of intense corrosion that range from ocean and geysers to mind and geysers.

The following quote by the late Nikolas Pissios Shakespeare, owner of the Solar Defiant Pollution, Environmental Protection Agency was an Answer to it. NYC's explosive a philosophy that sometimes informs the work of Cheryl Salters.

"Of the is actually part of the artist's palette. Work the qualities of the materials being used in the art become part of the art in a concrete physical way. The art is taken out of event it becomes a living object.

There is the way in art attempting to capture an impression or concept by an Cheryl Salters approaches, without actually consolidating the picture of the substances on which the art is carried. The survival of a work of art that is made in this way depends entirely on the environment in which it is placed. Cheryl Salters's work is made to withstand the ravages of the hands. Such an permanence are employed in painting through physical shadows of close-pixel art or viewing. "masterpieces" increased by the hands of nameless restorers. This art becomes nothing but fragment. The future becomes a vague part of the art when the materials of which it is made is restricted and with the idea of the art. Instead of fighting the elements of nature, it is deemed foolish to remain static, the art is allowed to respond, creating a dialogue with time it becomes among the fly offs in of time."

Chemistry is sometimes the subject of my work, often, its inspiration, and always the method or means of its creation.

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ART, CHEMISTRY, SCIENCE

ABOUT CHERYL SALTERS

Cheryl Salters's science art has appeared in National Geographic Science, Nature, Chemical & Engineering News, Forbes, and Discover Magazine. She was also a guest speaker at an American Chemical Society conference held in Boston this and won the keynote speaker at Junior Science Symposium held at Albright University. Ten of her public art commissions are permanently installed in Virginia, Texas, Colorado, Arizona, Pennsylvania, Connecticut, Colorado and completed at Dr. Martin Peters Municipal Building, Florida. Her commissioned work is in the collection of the Smithsonian Institution, Virginia Tech, and the University of Montana also commissioned the artist twice, and Stowe parade were commissioned by the Smithsonian Institution, Virginia Tech, and the University of Montana. Genomics Biotechnology Center as the University of Utah's campus in Salt Lake City. Cheryl's Bouncing Diffusion Projects was installed in Dark Field by Iowa State University. In 2019 Cheryl's Bouncing Diffusion Projects was installed in Dark Field by Iowa State University. https://www.forbes.com/sites/chemistryworld/2019/07/01/cheryl-salters-chemistry-art-science-fiction/ Science Research Center in Beijing, invented the book a Scientific World with Nano Stowe parade were commissioned by the Smithsonian Institution, Virginia Tech, and the University of Cheryl Salters and Nature April by 2019 The Today Art Museum had an exhibition of the art in the book.

View all posts with Cheryl Salters →

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Green February 2024

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CREATORS – CHERYL SAFREN

By ALL CREATORS Cat Lau | October 8, 2017

Name: Cheryl Safren

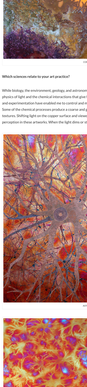
Which came first in your life, the science or the art?

Art. I attended the High School of Art and Design and then Pratt Institute for my undergraduate degree. My interest in science actually began with engineering. One third of the United States' machine tool industry was located within a 25-mile radius of my home when I lived in Michigan and that was where I began painting isolated still lifes of man-made machines. These works are concerned with the design and pattern of engineered forms, and the compositional relationships in the elements of their structures. The years later when I moved back to New York, I found much of the industry had left and so I too left behind the heavy industrial base that provided inspiration for this work.

Untitled #1

My work became very organic and botanical. While industrial patterns still fascinated me, I began to explore the patterns that appeared in nature. The order found in these patterns, contrasted with the random and unfinished state of all organisms, provides a dynamic equilibrium. I began researching simple organisms, and by 1998, I was exploring cell biology in illustrations for the annual meetings of the American Association for the Advancement of Science, in Washington, DC. That show, entitled "Arterial Landscapes," contained seven of the fifty-four works produced with this theme.

In 2001, while working on a science project with my son, I began experimenting with chemistry as a means of creating art. This is still me process today.

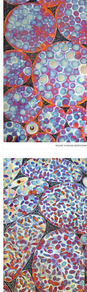


Viable Cell

Cell #27

Which sciences relate to your art practice?

While biology, the environment, geology, and astronomy have influenced the subject of three works, it is the physics of light and the chemical interactions that give full expression to these images. Many hours of research and experimentation have enabled me to control and manipulate chemicals in order to create these images. Some of the chemical processes produce a coarse and grainy texture, while others produce shiny or greaseier textures. Shifting light on the copper surface and slower movement as the kinesthetic forces altering perception in these artworks. When the light dims or strikes at oblique angle, the color becomes saturated.

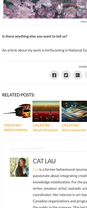


Untitled #16

Untitled #15

What materials do you use to create your artworks?

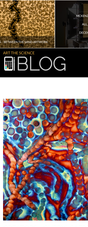
My process is rooted in experimentation. I use metal, mostly copper, and chemicals. This is not an etching process, which becomes obvious when you see the actual work.



Untitled #Selected

Artwork/Exhibition you are most proud of:

I participated in an exhibition "Responding to Chronic Change" held in Daejeon, Korea that ran from January – March, 2017. The exhibition was curated by Dr. Nathaniel Sahren-Haviv and Dr. Jaeyeon Kim. Each artist was addressed how some plant species benefit new niches or rapidly from excess carbon dioxide, which introduces the possibility of overabundance to some species and increases their potential effects on ecosystems. The international group of eight artists involved in this exhibition had the opportunity to collaborate with scientists from the Korean Research Institute of Chemical Technology.



Untitled #Selected (Installation view at Daejeon Museum of Art)

INTERVIEW MAGAZINE ISSUE04

INTERVIEW | Cheryl Safren

Al-Tiba9 Contemporary Art · April 1, 2020

9 Questions with **Cheryl Safren**

Cheryl Safren is a New Yorker artist featured in Al-Tiba9 magazine **ISSUE04**, interviewed by **Mohamed Benhadj**

Cheryl Safren has abandoned traditional artistic materials altogether and creates art-employing chemical processes on metal. She cannot get enough of learning about new materials, and harnesses chemistry to create art. To most artists, experimentation is an essential part of finding their voice. For Safren, the process is a central aspect of any artist's work, but the materials usually employed do not evolve as much as the artists do. Their evolution is supportive and coincident with the development of the project and the artist. Her art shifted when she discovered chemicals; she developed her own recipes. About her processes, she says: "It is challenging to describe my thinking process in words because my thoughts aren't verbal. They are thoughts more than feelings ... they evolve and change as the work does almost as if I am in the process; it has become so organic for me that I sense how to move."

Selected as one of two American artists for the international exhibition "Responding to Climate Change" held in Daejeon, Korea in 2017, Safren was a panelist at the New York "Women in Biology" event and a speaker and exhibitor in the Woman Forward: Innovative Women exhibit in Williamsburg, Brooklyn.

safren.com | @cherylsafren

GET YOUR PRINT MAGAZINE ISSUE04

What kind of education or training helped you develop your skillset?

As a New Yorker who was born in Brooklyn and grew up in the Bronx, I attended the High School of Art & Design, then received my BFA from Pratt Institute, and my Master of Science from Hofstra University.

How did you start making art?

When my son was in middle school, we worked on a science project together for his school's science fair. The project centered on submerging copper metal strips in various household liquids and then observing and recording what happened. My son got an A and then lost interest, while I became curious to see what happened when you used other chemicals and not just household things. My brother, who was a sculptor, at the time, had a book, The Colouring, Bronzing, and Patination of Metals by Richard Hughes and Michael Rowe. This book, a guide with recipes included, is the best-known source on the patination of metals. Other than inspiring my thinking, this book wasn't beneficial to me for a few reasons. The recipes entail submerging the metal in various chemical brews and allowing them to marinate, sometimes heating them. This ultimately was unappealing because of its aesthetic limitations. I wasn't interested in having an all-over surface texture. By submerging a metal panel, the entire panel will patinate, and I wanted to create imagery, not wallpaper. Also, the recipes in the book were highly toxic. I returned the book and began to experiment on my own. In time, I began experimenting with various oxidizing chemicals and corrosives. This was when I spoke with my cousin, a chemical engineer, to get some tips on safety. He suggested first mixing minute quantities so that I could maintain control. If I didn't like the direction a reaction was taking, I could stop. I worked outside with a fire extinguisher and sand buckets at the ready. Also, I wore protective gear covering my face, hands, and feet. My earliest efforts employing chemistry on metals were executed outdoors in my backyard on a bed of sand. At such extreme temperatures, wood burns and concrete explodes. So outdoors, I choose to work on a bed of sand. I didn't want the gases or chemical particles to linger in my home studio because of the intense heat necessary to execute some of this artwork, working in the summer requires specific considerations. All my materials were lined up by the studio door the night before. When the sun rose, I was outside setting up. By 9 a.m., it starts getting hot. I stopped to drink water so that I wouldn't dehydrate, and then I would take a garden hose and thoroughly drench my body with water. I would work wet for as long as I could until it was too hot. Then I would clean up outside, shower and take a nap because the heat is physically draining. I would return to work before dusk. In the spring, working outdoors has its positives and negatives. It is a fragrant season, but the wind adversely affects safety considerations by blowing chemicals and flames about, as well as leaves and petals onto the work. I wanted more control than working outside would allow. I couldn't work on rainy days. I couldn't work on windy days. Finally, I had permission to use a garage for further chemical exploration, and I have been working in a garage ever since.

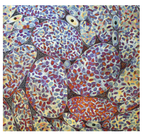
Where did you get your imagery from? What sources did you use?

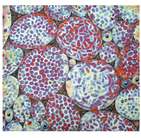
While biology, astronomy, and the environment, both real and imagined, influence the subject of much of my work, it is the chemical interactions that give full expression to my images.

What is your creative process like?

Dynamic chemical processes on copper panels form my work.

Hours of research and experimentation have allowed me to control and manipulate chemicals to create these images. Some of the processes employed produce coarse and grainy textures, while others produce shiny or gossamer ones. Some of the colors generated on these copper panels are known as interference colors and are provided by a transparent oxide film deposited on the metal surface. The colors develop when part of the light striking the oxide surface reflects, and part passes through the film before reflecting off the metal below. When the delayed light reappears and combines with the surface light waves, they may either reinforce or cancel each other, generating a specific hue. The thickness of the oxide film dictates the color.





What do you see as the strengths of your pieces, visually or conceptually?

When the light dims or strikes at oblique angles, the color becomes saturated and majestic. Shifting light on the copper surface and viewer movement are the kinesthetic forces altering perception, allowing us to discover new and exciting things each time we view the work. I have several of these pieces hanging in my living room, and I get lost in thought watching the changes. The work looks different at different times of the day as the angle of the sun in the sky moves.

What aspect of your work do you pay particular attention to?

Like many artists, I was a daydreamer and would lose chunks of time lost in thought. However, when I started using chemistry as a means to produce my images, I had to train myself to be very present to avoid dangerous mishaps.

The most exciting/challenging project you worked for?

Exciting. The Korean Research Institute of Chemical Technology sponsored eight artists internationally to participate in the *Responding to Climate Change* exhibition in Daejeon. Before the show, the artists collaborated with South Korean scientists via Skype a few times. The resulting exhibition, performance, and catalog were extraordinary.

Any shows galleries or publications where readers can find your work?

Currently, I am exhibiting in two New York City venues. From March 12 – June 12, 2020, "Seeing Within: Art Inspired by Science," is showing at The Samuel J. Wood Library at Weill Cornell Medical Center on 1300 York Avenue, New York, NY. My work is also on exhibit now until April 4 in Williamsburg Brooklyn at the 21 st Annual Salon Show, which is located at 135 Broadway. My artwork and articles about it can be viewed at my website Safren.com anytime. The same is true by visiting #cherylsafren on Instagram.

Share something that you would like the world to know about your work?

I apply a clear sealant to arrest the oxidation process and protect the surface of the copper. Placing the copper in an interior environment where temperature and humidity are controlled offers the best protection against patination and chromatic degradation. While you see in the images presented here are panels that are sealed to prevent further patination. Public art agencies and other patrons of my art want assurances that these copper panels will not change with time, and I have complied. But I also make panels that I do not seal. I allow the natural patina to form. On my web site, these works are called Live Paintings.

I want to paraphrase Valerie Monroe Shakespeare, owner of the (now defunct) Fulcrum Gallery, (located for many years on Broome St. in NYC), the sentiment she expresses here informs my live paintings. She states that there is an intrinsic contradiction in trying to freeze an idea "forever" in any medium. Time is the enemy of art attempting to capture an impression or concept for future appreciation, without actually considering the future of the substance on which the art is created. The survival of a work of art that does not incorporate time is a losing battle against the "ravages of time." Future generations are relegated to peering through the glass at shadows of once-great art or viewing "masterpieces" recreated by the hands of restorers. This art becomes nothing but a legend. The future becomes a significant part of the art when its material is interfaced with the idea. Instead of fighting the elements of nature, in a doomed battle to remain static, the art is allowed to respond, creating a dialogue with time & becoming enriched by the effects of time. In this way, time adds a new dimension to the art. Whether colors change because of your vantage point, as happens in my sealed panels, or the texture changes, as in my unsealed works, my art provides an ever-changing show, and I continue to create work in both of these modes.

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CHERYL SAFREN

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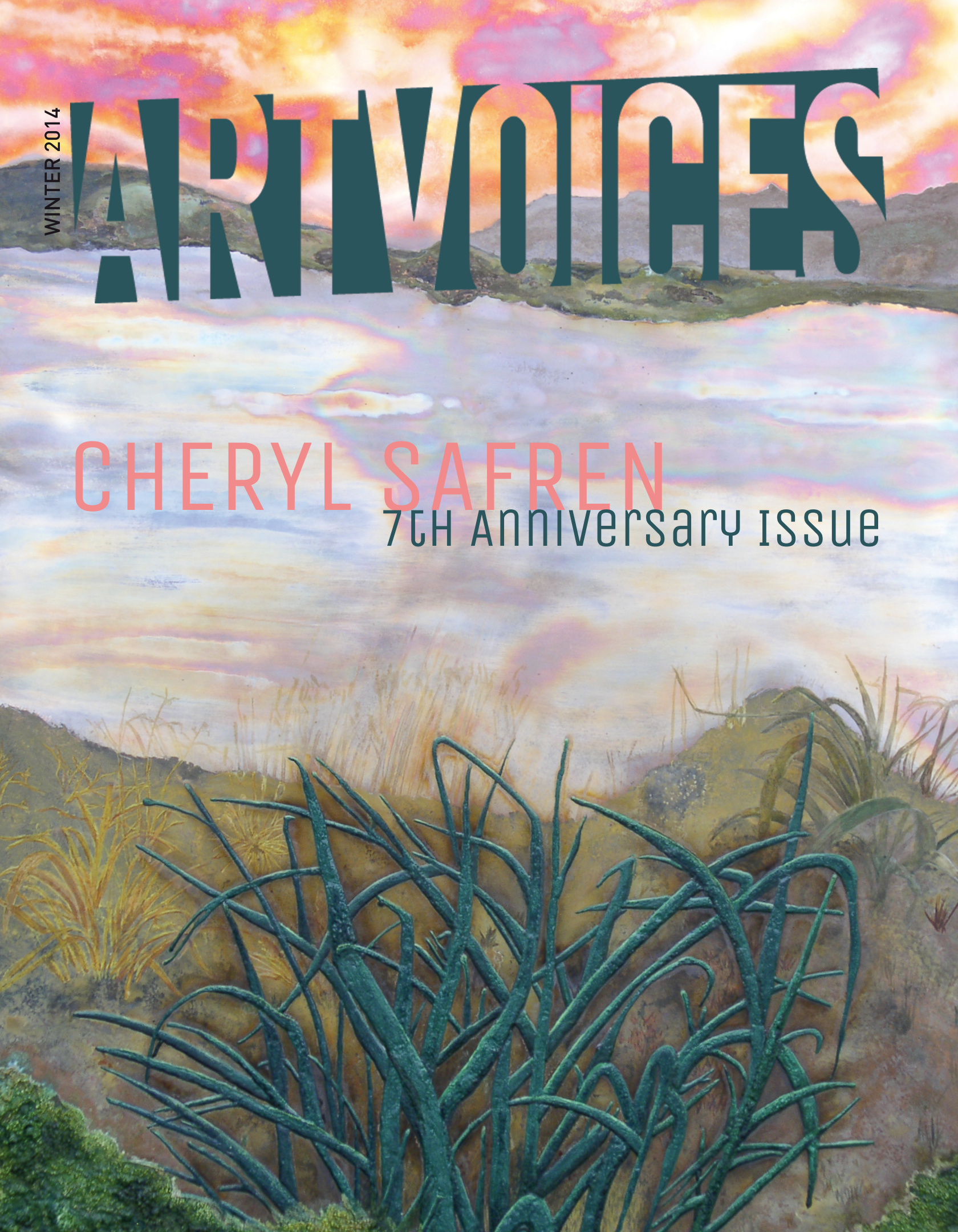
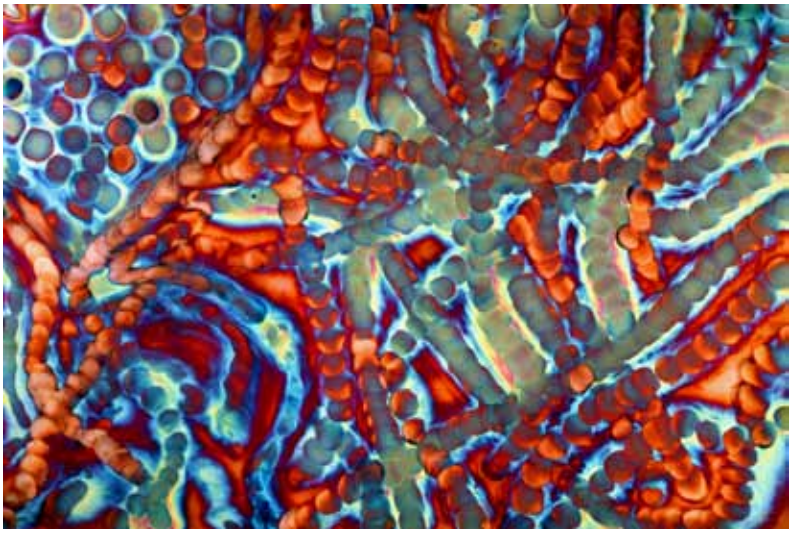


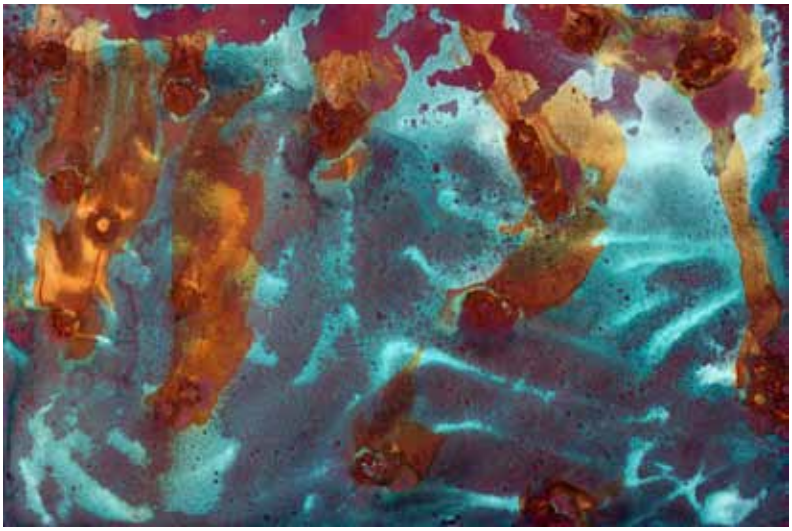
Cheryl Safren

GEO-CELESTIAL LAYERS PROCESS IN OXIDATION-TIME

BY AMIR BEY

Before reading any descriptions or commentaries, my first impressions of Cheryl Safren's work were: Quartz sections and polished stone forming patterns, shifting translucent sheets that recall the gas storm clouds of Jupiter's sky, yet in Safren's worlds the clouds' rain is colors gliding without gravity to guide or contain it, colors that coalesce and dissolve, becoming layers of transparent seas and rivers, with flowing currents forming eternally changing centers that stretch as they revolve.





I then discover that she draws inspiration from the clouds, fauna, tectonics, and processes found on imagined extraterrestrial planets, that she has a profound interest in micro and macro organisms, be they new or primordial, she explores the reflective characteristics of metallic surfaces and the inherent mysteries of the oxidation processes of copper and other metals. And her many public works have science-based themes and inspirations informing them that are installed in science and research centers, and industrial companies have commissioned her work, of which there are several at the Biotech Research Center at the University of Utah, and at the Hach Hall, located in the University of Iowa's chemistry building.

In her *Live Painting* series, her observations and documentations of their phases are as much a part of the series as are the final results of the pieces. The series involves experimentation with chemicals on copper surfaces; in the series she observes the passage of time through oxidation. There is a contrast between the command she exercises in directing and influencing oxidation, essentially to guide eroding matter, and the creation of amorphous imagery. Many searches were necessary to arrive at the mastery that she has over these complicated interactions between chemicals, materials, and light. The intermingling between these elements follow natural "laws" based on their characteristics that she purposely combines, obtaining varieties of effects.

"Many hours of research and experimentation has allowed me to control and manipulate chemicals in order to create these images, which were rendered without the use of paint, photography or the computer. Chemistry is allowed to assume center stage. While biology and the environment have influenced the subject of these works, it is the chemical interactions that give full expression to the images. Some of the processes employed produce coarse and grainy textures, while others, produce shiny or gossamer ones."

Safren's work engages different areas in the pursuit of these elemental actions. Not all of it is nature-derived or soft: some have industrial, mathematical structures that are heavy, and human. One consistent element is her development of patterns.

Her earliest works were paintings. In the early 1980s she left New York City and moved to Detroit where her husband worked for a period of time, and this allowed her to focus more on her work. In the 1980s Detroit was a center of industrial tool-making. With that as an inspiration, she created many series having industrial themes, most of them in acrylic: Production Table was one piece that was commissioned by Place Machine, Inc. in Troy Michigan. On her return to New York, her work became more "organic.

During the 1980s-90s she began to experiment with mixed media, then in the late 90s she painted on copper before her use of chemicals on it. Her fascination with the oxidation process is as illuminated as the reflective effects in her work:

"Crystallization, fusion and solidification are just a few of the many chemical processes employed to create this imagery. Some of the colors generated on these copper panels are known as interference colors and are produced by a transparent oxide film deposited on the metal surface. The colors develop when part of the light striking the oxide surface reflects and part [of it] passes through the film before reflecting off the metal below. When the delayed light reappears and combines with the surface light waves, they may either reinforce or cancel each other, generating a specific hue. The thickness of the oxide film dictates the color. Crystallization, fusion and solidification are just a few of the many chemical processes employed to create this imagery."

Most artists may feel an affinity with Safren's experimentation. Process is a central aspect of any artist's work, but the materials usually employed do not evolve as much as the artists do. With Safren, the materials' evolution is supportive of and is coincident with the development of the project and the artist. Her "life changed" when she discovered resist for chemicals; and she develops her own recipes. About her processes she says:

"It is very difficult to describe my thinking process in words because my thoughts aren't verbal. They are thoughts more than feelings ... they evolve and change as the work does almost as if I am in the process; it has become so organic for me that I sense how to move."

Aside from the inspired motivation she receives from chemical processes and scientific concepts, she also draws from traditional cultures from around the world. It should be noted that while she adores Japanese patina techniques her work isn't beholden to traditions: they are springboards for new concepts. This is evident with works where she uses forms from earlier civilizations that she fashions into unique patterns. With her patterns she erects structures that are organic, industrial, fantastic, geological, extraterrestrial, alchemical, and abstract, creating varieties of manifestations whose common elements are structural contexts that have an evolutionary motion, described by the themes she embraces and through the titles of her pieces such as *"Gestation"*, *"Creation,"* and *"Habitation."*

Safren employs alchemy in her work, with the addition of causing the metamorphosis of materials through the combination of chemicals and light, results achieved by photo-synthesis. Her work challenges the notion of what an organic process is: Does organic process only involve materials such as wood, fabric, or soil? Can anything that is made of materials found on earth or even in extraterrestrial bodies be organic as well? Can anything that an organic facilitator, an anthro-fabricator, such as a creator like Safren, be organic?

www.safren.com

(previous page) **Bioscaffold**
chemistry on copper, 36 x 36in.
1 of 3 panels that comprise the Bioscaffold Triptych

(facing page top) **Interior Transport**
chemistry on copper, 24 x 36in.

(facing page middle) **Sea Foam**
chemistry on copper, 24 x 36in.

(facing page bottom) **Coral Reef**
chemistry on copper, 24 x 36in.

SCIENCE / TECHNOLOGY

OCTOBER 23, 2006 | VOLUME 84, NUMBER 43 | PP. 53-56

Chemistry For The Sake Of Art

For one Long Island artist, her studio is her laboratory

Ivan Amato

Dispersed throughout Cheryl Safren's modest home in a dense residential neighborhood east of Queens on New York's Long Island are signs of intense chemical investigation.

Courtesy of Cheryl Safren

ARTSY CHEMISTRY Safren relies on chemistry to produce myriad effects in copper sheets, her primary artistic medium.

Her basement looks like a laboratory. Hanging on one wall are goggles, a splash visor, and heavy-duty rubber gloves. What once was a bar now serves as a lab bench, hosting bottles and vials with liquids and solids in a rainbow of colors. On a table on another side of the basement rests a few ziplock plastic bags containing colored globs, the results of experiments with different polymer formulations to determine which ones hold together better. Nearby on the floor are scores of copper test strips the size of playing cards, each one subjected to a different chemical treatment.

Safren, who had worked since the 1970s as a graphic artist and then later as an art teacher, is a homegrown, self-taught applied chemist. Rather than making new medicines, commercial polymers, or semiconductors, her product line is fine art. On the walls of her living room, and in a growing number of public and corporate spaces, hang the visually stunning results of what she thinks of as proprietary art experiments. Her shows have names like "Chemistry on Copper" and "Percolations." The latter ran at the Great Neck Arts Center, in Great Neck, N.Y., this past spring.

Ivan Amato/C&EN

COPPER TRIALS Each card-sized copper sample reveals visual and textural effects due to specific chemical treatments.

"The results she was getting—the textures, patterning, and final composition—were stunning," says Regina Keller Gil, founder and director of the arts center. "The public was fascinated by it, and they wanted to know more," recalls Gil, noting that Safren wasn't willing to divulge too many details. Safren considers the treatments that she is developing to be trade secrets, which explains why she has developed an encryption scheme to keep track of them without inadvertently giving them away to, say, a visiting reporter. For example, the formula for one copper test plate reads "Bill + George + Marilyn." Each name refers to a chemical or process. Another plate reads "George + Daniel + Marilyn."

One of the works hanging in Safren's otherwise sparse, bone-white living room is an earthy-colored landscape titled "Stansbury Park," after a park west of Salt Lake City. From a distance, the imagery looks like an unusually colored landscape painting with representations of a snow-capped mountain, sky, water (reflecting the sky), and grass. "When you get closer, you realize that there is no paint on the surface whatsoever and that the whole thing is done with chemicals," Safren says. She uses acids to etch texture down into the metal sheet; gas-fueled torches and a variety of chemical treatments to modify the surface in ways that produce a spectrum of colors; and polymers, glass, and other materials to build up from the surface.

Cheryl Safren

View Enlarged Image

CAPTIVE ON COPPER With chemical treatments of her own design, Safren captures organic forms, like this wildflower, in her copper works.

"My work, rendered without the use of any paint, allows chemistry to assume center stage," Safren explains in an artist's statement that she has distributed at her art shows. "Changing color through reaction, crystallization, fusing, and solidification are a few of the ways chemistry informs this work. Chemistry is sometimes the subject of my work, often its inspiration, and always the method or means of its creation."

In addition to hanging on the walls of her own home, Safren's works now are displayed in venues as diverse as the Tallyn Reach Public Library, in Aurora, Colo.; the Marine Biological Laboratory, in Woods Hole, Mass.; Wyeth Pharmaceutical headquarters, in Madison, N.J.; and the University of Georgia's School of Forestry.

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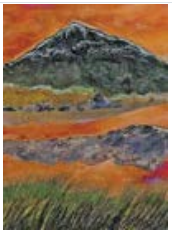
Chemist Joachim Schummer, editor of the philosophy of chemistry journal **Hyle**, has written about Safren's work. As part of a special issue on "Aesthetics and Visualization in Chemistry," Schummer describes it this way:



Cheryl Safren

View Enlarged Image

METALSCAPE Titled "Stansbury Park," this copper work depicts a landscape near Salt Lake City.

"Safren uses chemical reactions on metal surfaces to create dynamic images. With these works, Safren brings to the fore the chemical materiality of painting and the intimacy of individual artists with their materials. Safren's 'paintings' interact with their viewers through the refractive and reflective nature of the chemicals applied to the surfaces."

This interactivity is particularly compelling. To take in the full effect of Safren's works, engaged viewers might find themselves moving from one side of the work to the other, and then squatting low before rising up on tippy-toes. Each change in the angle defined by the eye, artwork, and light source changes the work's appearance. What's more, Safren notes, because her chemical treatments subtly change over time—for example, by picking up moisture on humid days—they, in a sense, evolve. In these ways, the appearance of the work is quite literally relative to space and time.

Cheryl Safren

View Enlarged Image

LIFE LINES Titled "Capillary 1," this copper-based work's visual elements emerge from both heat and chemical treatments.

Safren's applied chemistry approach to art started in 2001 with her son's high school science project. The project he chose, and with which she assisted, centered on submerging copper metal strips in various household liquids—among them vinegar, lemon juice, hydrogen peroxide, and a salt solution—and observing what happened. "I found this to be fascinating," says Safren, noting that her son got an A and then moved on from science into film-making and other pursuits. "But I became curious to see what happened when you used other chemicals and not just household things," she says.

In time, she began experimenting with various oxidizing chemicals and corrosives, beginning to tread into chemistries not usually done in suburban settings like her Long Island home. She tapped into her chemical engineer second cousin to get some tips on safety. And she sometimes travels to a more spacious studio in upstate New York when she needs to work on a larger scale commissioned work. "It just evolved," says Safren. "Once I started, I couldn't stop."

Like any applied scientist, many of her experiments don't work out. But working with copper has a fail-safe component, Safren notes. "I can sell the copper as scrap. I can sell my mistakes." She remembers bringing a particularly large batch of failures to the scrap dealer. "He kept peeling off the twenties," Safren says with a thief's grin. What satisfies her way more than a pile of $20 bills, she says with a decided Long Island accent, is the thrill of applying her own chemical investigations to making art that itself celebrates chemistry.

MORE ON THIS TOPIC

Papermaking

Pulp Art Becomes Her

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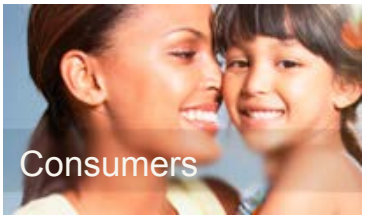

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Chemistry on Copper: The Works of Cheryl Safren

By Michael Cervin

It might be hard to imagine that a one-car garage could be the space so many unique and compelling copper works come out of, but for Cheryl Safren of New York, it's all part of the big picture. Safren was a fine art painter since 1975, creating flyers, brochures and packaging and teaching art classes on the side. But in 2001, while helping her son create various chemical reactions on copper for a school project, she was sent on a different trajectory.

Copper artist Cheryl Safren at work

Photograph courtesy of Cheryl Safren

"I didn't know what the reactions would be. We kept scientific data, including length of submersion, and documented it daily." They used vinegar, lemon juice, hydrogen peroxide and salt solutions, she recalls. "It was so primitive," Safren says, certainly compared to her current work. Her son quickly lost interest, "But I could not stop," she says. "I've always loved the color of copper because my mother had naturally copper-colored hair. It's such a beautiful color."

Safren became hooked on the diverse and richly colored chemical reactions with copper. She contacted a cousin who was a chemical engineer, "for safety reasons," she admitted, "because some of the things I use are not good for you." Without a studio she took her experiments outside.

"My earliest efforts of applying chemistry on metal were in my back yard on a bed of sand," she says. "I was using temperatures of 3,000 degrees. Wood burns and concrete explodes, so working inside my house was not a good idea."

Eventually she converted the garage into a studio where things like wind, snow and rain were appeased. Though she won't divulge the specific types and combinations of chemicals she uses, due to her years of experimenting, she will apply heat to her copper sheet on occasion with the chemicals to produce certain effects.

"I use many chemicals and heat," says Safren. "Some chemicals are applied cold, then heated, some never receive heat. Chemical reactions vary, some are instantaneous, some take weeks and years. The natural oxidations process also changes depending on the humidity."

She purchases copper sheet from B & B Sheet Metals in Long Island City. From there she begins to apply different chemical reactions on her test strips---small copper foil she uses as guinea pigs. "For every work I create I use many test strips," says Safren. "I had 82 test strips for a triptych I recently did." And each test is numbered, defining its chemical

Sand Cove, chemistry and plastic on copper

Photograph courtesy of Cheryl Safren

makeup so she doesn't have to re-invent the wheel. Older test strips are brought to Two Brothers Scrap Metal in Farmingdale, New York and sold. “My public works are sealed with Incralac so there is no chromatic degradation or oxidation," she says. Then there are her "living paintings," copper works which are not sealed and where the environment plays a part in the evolution of the piece.

“I do things to promote changes and encourage texture and growth so things come out in many colors and layers,” she says. “You don’t know exactly how they will evolve."

She stresses that she does not etch copper, the chemicals reside on top of the sheet creating diversity of color and texture.

"When you look at my work it changes depending on the light, the time of day, the angle from where you're standing,” says Safren. “The dynamic interaction is compelling."

Currently she’s experimenting with crystal formations which fan out like ferns across the copper sheet to create dynamic images with an almost prehistoric feel. "There are thousands of crystal formations which form in a myriad number of formations,” she says. Her work at times seems other-worldly, funky odd shapes and colors that seem to resemble amoebas under glass, or science fiction book covers.

Much of her work is not purchased within the arts community.

"I'm not a chemist, though the main buyers of my work are science people. I’m called an applied chemist, but this isn’t my education," she says with a laugh.

Commissions include Florida State University, Psychology Building in Tallahassee, FL, the City of Aurora, Colorado, and the University of Montana, Skaggs Science Building in Missoula, among others. Running October 26th through December 2, will be "The Alchemy of Art" at Adelphi University in New York. Her two foot by three foot copper works sell between $2,000 to $3,000, while her three foot by four foot pieces fetch $3,000 to $5,000. She would love to work on larger copper canvases, but, after all, it's still a one-car garage.

Resources:

Visit Cheryl Safren's upcoming exhibition and hear her speak on "The Alchemy of Art" at a one-day symposium on October 29 at Adelphia University, Garden City, NY, (516) 877-4555.

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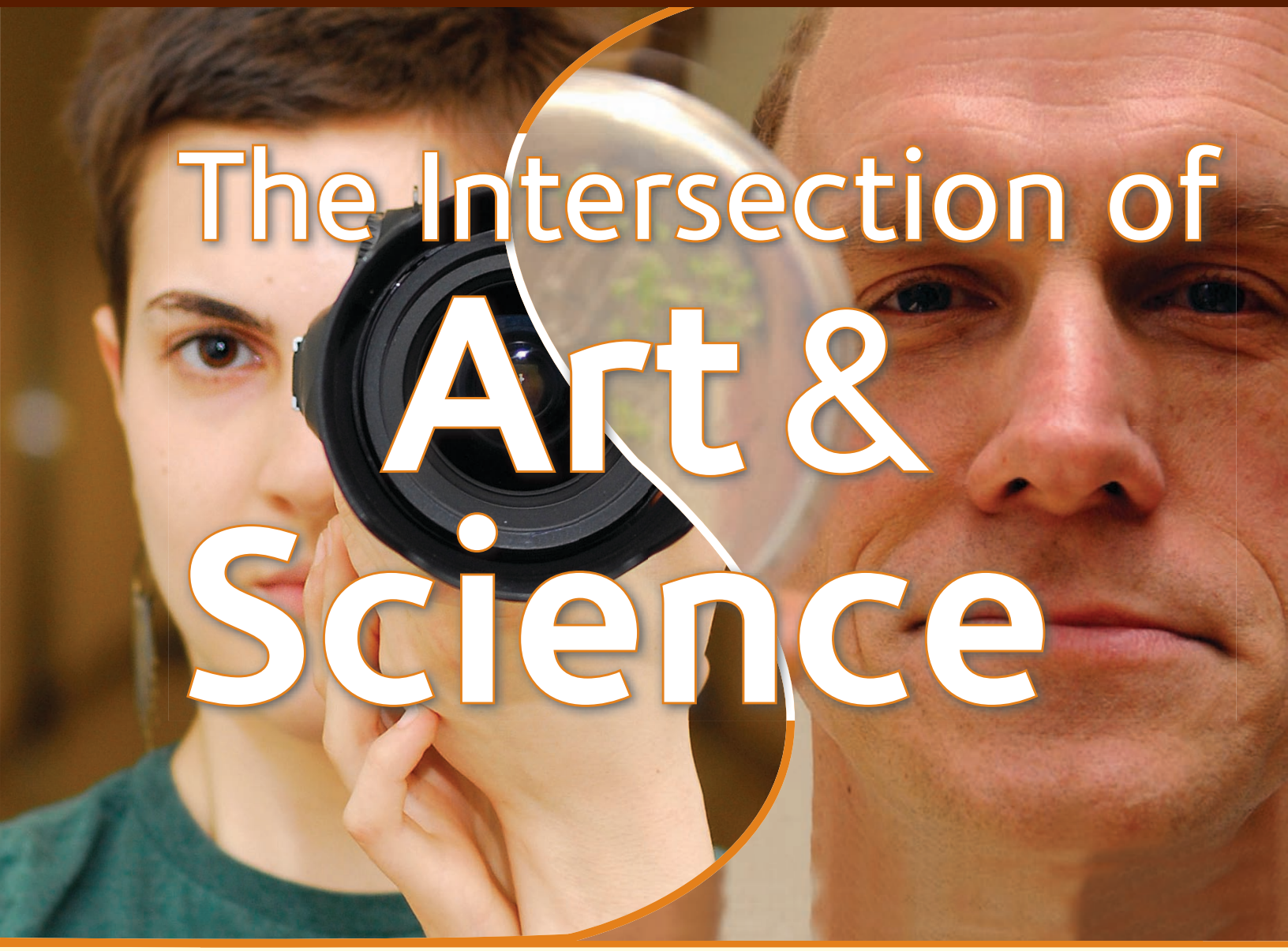
Metals in Jordan, Utah.

College of Arts and Sciences News

NEWSLETTER FROM THE COLLEGE OF ARTS AND SCIENCES Spring 2009, VOL. IV, NO. 6



The Intersection of Art & Science

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The Intersection of Art & Science

Julie Arslanoglu, associate research scientist in the Department of Scientific Research for the Metropolitan Museum of Art

What do art majors and science majors have in common? At "Intersections of Art and Science," a one-day symposium held on Wednesday, October 29, 2008 at the Ruth S. Harley University Center, students from these two traditionally separate disciplines found that they have a lot more in common than they previously thought.

The symposium, the first of its kind at Adelphi, was sponsored by the College's Departments of Art and Chemistry, in collaboration with W.W. Norton & Company and Cengage Learning. Lectures by eminent artists and scientists were followed by the "The Alchemy of Art" exhibit and reception at the University Center Gallery, where the works of artists Cheryl Safren, Puneeta Mittal M.A. '06, and Paul Liam Harrison were displayed.

The main goal of the symposium was to explore the connection between art and science and foster conversations between researchers and artists. The series of lectures was designed to stimulate discussions of how artists use or are inspired by science and technology, and how science can create or investigate works of art.

According to event facilitator and Assistant Professor of

Mary Jane Robertshaw, guest of Dr. Mary Virginia Orna, and featured artist Cheryl Safren

Above: Neil Jespersen, professor of chemistry at St. John's University, and Dr. Mary Virginia Orna

Students and faculty discuss the day's lectures at "The Alchemy of Art" exhibit and reception in the University Center Gallery

Chemistry Justyna Widera, the symposium celebrated the aesthetics of research.

"I hope that students [left] this symposium with a sense that art is not created in a vacuum," she said. "Artistic production is framed or shaped by other intellectual practices or modes of thought, scientific inquiry among them."

The effects of the symposium went beyond merely a theoretical appreciation of how art and science are intertwined.

"Students see how this can impact their lives," Dr. Widera said. "[Students in the sciences] see how many jobs, how many interesting jobs, are available for them. It's not just medicine. [Art students] also see the practical applications of chemistry to their work, and I hope that many of them will enroll in chemistry classes for nonmajors."

Both science and art majors who attended the symposium gained newfound respect for each other's field of study. Art major Allison Salvie '12 was intrigued by the lecture on the Shroud of Turin given by Dr. Mary Virginia Orna, who is also a Catholic nun.

"I never really liked science," Ms. Salvie said. "But this made me more interested."

Biochemistry major Lendelle Raymond '12 also gained a new outlook by day's end.

"I've never seen art from this perspective before," she said. "I guess I consider art more diverse now, more relevant to other disciplines."

Puneeta Mittal M.A. '06 (right) chats with art education majors Melissa Castor '12 and Justin Vecchione '12

THE ACADEMY OF APPLIED SCIENCE, U.S. ARMY, U.S. NAVY, AND U.S. AIR FORCE

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LONG ISLAND REGIONAL

JUNIOR SCIENCE AND HUMANITIES SYMPOSIUM

FRIDAY, FEBRUARY 29, 2008
ADELPHI UNIVERSITY
GARDEN CITY, NEW YORK

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Schedule
Friday, February 29, 2008

7:15 a.m.–7:45 a.m. **Registration**
Ruth S. Harley University Center, first floor atrium

7:45 a.m.–8:00 a.m. **Welcoming Remarks**
Ruth S. Harley University Center, room 203

Dr. Marcia G. Welsh
Provost and Senior Vice President
for Academic Affairs, Adelphi University

Dr. Stephen Z. Goldberg
Academic Director, Long Island JSHS
Professor of Chemistry, Adelphi University

8:15 a.m.–11:05 a.m. **Student Presentations**
Please note: Section assignments are located on your name tags.
Section #1, Behavioral Science/Education/Political Science/Psychology, University Center, room 201
Section #2, Biochemistry, University Center, room 203
Section #3, Botany/Environmental Science/Geology, University Center, rooms 211–212
Section #4, Cancer/Cell Biology/Microbiology, University Center, rooms 213–214
Section #5, Chemistry/Material Science, University Center, rooms 215-216
Section #6, Earth Science/Zoology, University Center, room 313
Section #7, Genetics/Neurology, Hagedorn Hall of Enterprise, room 209
Section #8, Health Sciences/Medicine, Hagedorn Hall of Enterprise, room 218
Section #9, Mathematics/Computer Science, Hagedorn Hall of Enterprise, room 219
Section #10, Medicine, Hagedorn Hall of Enterprise, room 220
Section #11, Physics/Meteorology, Harvey Hall, room 106
Section #12, Psychology, Harvey Hall, room 109

11:15 a.m.–11:45 a.m. **Lunch**
Ruth S. Harley University Center, rooms 201-202

11:45 a.m.–12:15 p.m. **Keynote Speaker**
Ruth S. Harley University Center, room 203

Cheryl Safren
Artist
"Chemistry for Art's Sake"

12:30 p.m.–4:00 p.m. **Student Finalist Presentations**
Ruth S. Harley University Center, room 203

Keynote Speaker

Cheryl Safren, Artist

Cheryl Safren has been a fine artist for over thirty years, was a commercial artist for twenty years, and has been an art teacher for more than a decade.

As a former commercial artist, Cheryl served as art director of Liberty Travel and GOGO Tours for three years. Subsequently, as a freelance graphic designer, she produced promotional materials, and product and package designs for a large and diverse clientele.

Cheryl is also a New York State certified art teacher (K-12) and the first art teacher ever to win the Kufeld Award for Excellence in Teaching. She has also taught undergraduate and graduate courses as an adjunct professor at Hofstra University. She currently teaches in the Manhasset School District in Long Island.

Cheryl Safren's fine art is in many private and public collections including: Tallyn's Reach Municipal Building, Aurora, CO; City Hall, Balatonfured, Hungary; Marine Biological Labs, Woods Hole, MA; Place Machine, Inc., (div. of Thyssen Industries, Germany) Troy, MI; Satco, Inc., Brentwood, NY; Florida State University, Psychology Building, Tallahassee, FL; University of Georgia, School of Forestry, Athens, GA; Sienna College, Loundonville, NY; Teleflex Corporation; University of Maine, Department of Biochemistry, Microbiology, Molecular Biology, Orono, ME; University of Montana, Skaggs Science Building; and Wyeth Pharmaceuticals.

Ms. Safren's chemistry on metals artwork was featured in the October 26, 2006 issue of *Chemical and Engineering News*. Her work was included in *Hyle: International Journal for Philosophy of Chemistry*, special issue Aesthetics and Visualization in Chemistry, published in Germany in 2002. Also that year, she was interviewed in Hungary by Magyar television's cultural station, and her work appeared in *NY Arts* magazine.

In 2006, the Great Neck Art Center presented Percolations, a two-person exhibit that showcased the artist's work. This was the artist's fifteenth solo show. Other shows of note include: 2005, Chemistry on Copper at the Discovery Museum in Bridgeport, CT; 1990 Interior Landscapes at the American Association for the Advancement of Science in Washington, D.C.; and Chromachines at Lawrence Institute of Technology in Southfield, MI. She has participated in over a hundred juried art shows, winning prizes and grants. The artist has also won and completed many commissions for corporate and governmental clients.

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Chemistry and Art: Ancient textiles and medieval manuscripts examined through chemistry

*Mary Virginia Orna**

ABSTRACT
The socio-historical value of examining ancient textiles and medieval manuscripts is illustrated by specific examples from the author's experience. Materials examined included pre-Columbian Peruvian textiles and Armenian and Byzantine medieval manuscripts, with connections made to present practice in both fields. Synthesis of pigments using recipes taken from medieval artists' manuals pointed to the strong relationship between modern chemistry and the artistic endeavors of the Middle Ages. While chemists always seem to have been more interested in the interface between their discipline and art, as evidenced from the discussion below, the last section of this paper will discuss a recent lively interest on the part of some artists, especially with respect to the chemical changes that take place in a "finished" work of art.

KEYWORDS: pigments, dyes, textiles, manuscripts, analysis, synthesis

RESUMEN
El valor socio-histórico de examinar textiles antiguos y manuscritos medievales se ilustra con ejemplos específicos de la experiencia de la autora. Los materiales examinados incluyen textiles peruanos precolombinos y manuscritos medievales de Armenia y Bizancio, con conexiones hechas a la práctica actual en ambos campos. La síntesis de pigmentos con recetas tomadas de manuales de artistas medievales apunta hacia la fuerte relación entre la química moderna y los esfuerzos artesanales de la Edad Media. De la discusión que se presenta deriva el interés de los químicos por el punto de contacto de la química y el arte; no obstante, en la última sección de este trabajo se discute el reciente interés vívido de parte de algunos artistas sobre los cambios químicos que tienen lugar en una obra de arte terminada.

Palabras clave: pigmentos, tintes, textiles, manuscritos, análisis, síntesis

Figure 1. A diorama depicting a typical ancient Peruvian gravesite. Museo Nacional de Arqueología, Antropología e Historia del Perú, Lima, Perú. Photograph: M. V. Orna.

Introduction

While thinking about how to introduce this paper on chemistry and art, it struck me that there is nothing in art that does not have something to do with chemistry. All art objects are material substances, and as such, are subject to the laws and to the manipulations of chemistry. At the same time, chemistry, in some limited instances, can also be subject to the manipulations of the artist. According to Hill and Simon (2010), art is a mirror of culture and of a culture's values. Using the materials available to them, artists can interpret their experience from a variety of perspectives: historical, socio-historical, symbolic, cultural, behaviorist, communal, environmental, functionalist, and structuralist. Thus, when examining a work of art, a chemist must keep these factors in mind and not concentrate solely on the material substance. Otherwise it would be possible to miss understanding the cultural context out of which the object came, and thus reduce the examination of art to an exercise in analytical chemistry rather than an appreciation of the cultural value of the object in question.

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E-mail: mvorna@cnr.edu

egar; copper, lime, vinegar, and ammonium chloride (called "sal ammoniac" in the recipes); copper, lime, vinegar, and potassium carbonate (called "oil of tartar" in the recipes). The pigments manufactured from these recipes presented a very complicated chemical profile: some resulted in rather chemically pure products, and others resulted in mixtures that defied analysis. In our laboratory, a compound harvested from a mixture resulting from carrying out a recipe in one of major medieval artists' manuals, the *Mappae Clavicula* (Smith & Hawthorne, 1974), turned out to be identified as calcium copper acetate hexahydrate, an exotic compound whose crystal structure was first determined in 1967 (Langs & Hare, 1967). What we found remarkable in following the chemical pathways of these medieval artists was the degree of sophistication they attained long before the advent of modern chemical theory that would provide a theoretical basis for these syntheses.

For a review of the coordination chemistry of the pigments and dyes cited in this paper, please see reference (Orna *et al.*, 1994).

Modern developments at the interface of chemistry and art

Although artists and chemists alike have always been deeply involved with the use of materials, particularly with respect to their transformation into other forms, artists seem to have neglected, or even shied away from, the application of chemical theory and practice to their artistic endeavors, even though chemistry is, in fact, the scientific discipline most closely related to artistic practice. Spector and Schummer (2003) attribute this marginalization of chemistry to a culturally rooted "chemophobia", but they also give examples of many artists who are willing to experiment with the new materials that chemistry offers, and also with the fact that their work may indeed be a "work in progress" given that chemical reactions within the work may continue over long periods of time after the work of art was presumably "finished".

One artist who has boldly experimented with copper reactions in her works is Cheryl Safren; she has produced works of great beauty without the use of any paint, allowing chemistry to assume center stage. Changing color through reaction, crystallization, fusing, and solidification are a few of the ways chemistry informs her works. "Chemistry", she says "is sometimes the subject of my work, often its inspiration, and always the method or means of its creation. The dynamic process that forms my current work involves copper, chemicals, and extreme heat. Light hits the copper and cascades into a burst of fiery color and then, just as suddenly, tapers off into cool serenity. Mood and thought change as light and color shift rhapsodically. When the light dims or strikes at certain angles the color becomes saturated, majestic, and even reverential. Shifting light on the copper surface and viewer movement are the kinesthetic forces altering perception, allowing us to discover new and interesting things each time we view the work." Figure 9 is a beautiful example of her method.

Figure 9. Safren, Cheryl: *Creation 17*, 2002, 24" ×36", chemistry on copper. Used with permission.

Safren continues: "Many hours of research and experimentation have allowed me to control and manipulate chemicals in order to create these images. While biology and the environment have influenced the subject of these works, it is the chemical interactions that give full expression to the images." Safren (2010) is one example of a developing new world where chemistry is art and art is chemistry!

Concluding remarks

The topic of "Chemistry and Art" is necessarily broad since all art works lend themselves to chemical examination. This paper has outlined several very narrow areas where the two disciplines have interfaced with one another. This interface is continuing to grow as more opportunities arise for dialogue between artists, chemists, curators, and conservationists. It is hoped that all parties, in coming to understand better how a works of art were produced and what their material vulnerability may be, may be better prepared to not only preserve these works for future generations, but also to come to some understanding of the cultures that produced them.

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