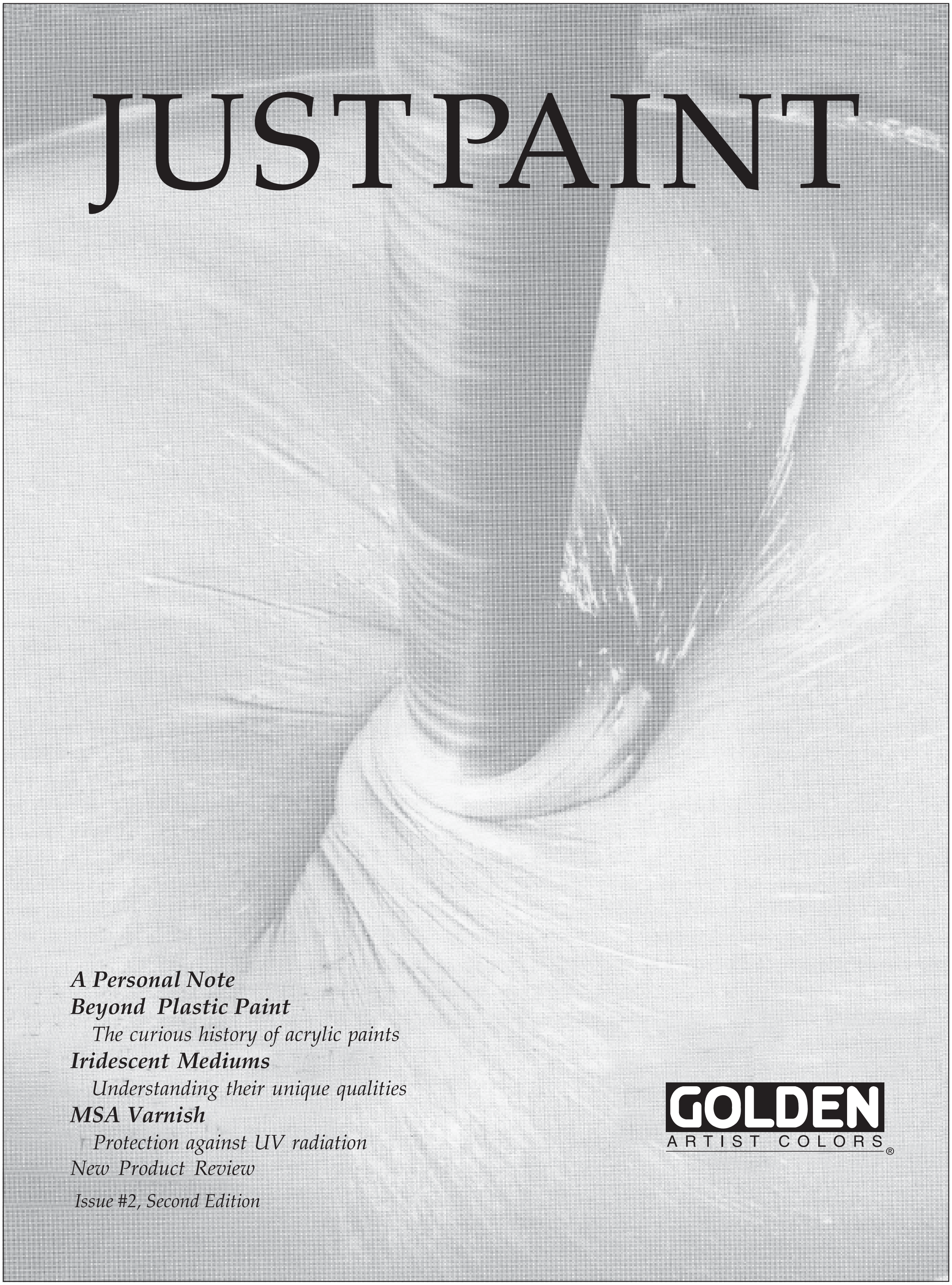
JUSTPAINT



Issue #2, Second Edition

GOLDEN ARTIST COLORS®

Dotted with farms on gentle slopes, New Berlin offers the quiet charm of an enchanted landscape. The air is filled with the smell of the growing season. This is the place where I learned my craft from my father, Sam. It certainly wasn't a planned thing. At Bocour they used to let me stuff letters or fill paint tubes into sets. So you can imagine that wasn't part of the plan. What happened? I got caught up in Sam's dreams, and they became my own. I marvelled at his creativity, and it struck in me the desire to create. At the early age of 67, Sam decided to return to his love - making paint - and with the return came me. Sam did not come to this place easily. He learned his trade at the infancy of an industry. Testing the new synthetic materials as they were developed, traversing the technology of these materials with his own brand of trial and error, he persisted. "Don't tell me it can't be done. Just let me be ignorant and believe that it can... Now leave me alone and let me do it." At Bocour, Sam enjoyed countless successes, as well as the true experimenter's share of failures. After Sam left the partnership at Bocour, he tried the retired life. Thankfully, there was my mom, Adele. I think she knew all along that he'd go back into business and that there were a lot ot things Sam had left to do. If it really be known, Adele was the motivator who endowed us all with the incredible confidence that we would succeed. So instead of living off their retirement income (as I would have done) they sold their paintings and started off on a new venture with the vitality of newlyweds. It has been almost eight years since our start. This letter does not mark any anniversary or landmark of Golden Artist Colors. It is my thank you to my mother and father and a celebration of life. Adele just went through successful open heart surgery. She knew the dangers of the situation, but let it be known to everyone that it was her decision and no one else's. It was the kind of courage that allowed us to begin this venture and the kind I hope will allow us to meet all the challenges of the future. Just six weeks ago we brought my mom home. Both Sam and Adele are quite tired over the ordeal, but assure me they will be back to pace soon. As families have tended to move further apart, not often are we fortunate enough to get to know the joys of being family. I have been fortunate enough to know the joys and fortunate to be able to say so.

Editors's Note:
The original edition of this issue was published in the summer of 1987.
Adele passed way in December, 1989.

Beyond Plastic Paint

Although Redtenbacher discovered acrylics in 1859, it was Otto Rohm who conducted the major work beginning in the early 1900's. Dr. Rohm produced the first commercial acrylics in 1928.

Since their introduction to the artist's palette in the 1940's, artists' acrylics have invariably been compared to oil paints. This comparison has made it difficult to understand acrylic paints in their own right as a useful and versatile tool for the artist. Oils have a traditional prestige, but in many ways acrylics prove to offer the artist better versatility, flexibility and ease of use.

At Golden Artist Colors we feel that we are in a unique position to discuss acrylic paints. We know the clear advantages acrylics offer, and we understand the full range of their technical properties. We also recognize that acrylics, like any paint or artist material, have their limitations and become useful only when an artist exercises control over the material.

In this short history we hope to provide information that will help artists discover, understand and gain control over a material we believe offers endless possibilities.

Suspended Polymers and Trapped Pigments

Understanding acrylic artist paint begins with a look at the paint's binder, which is usually an emulsion polymer. Acrylic polymer is an organic material. The name derives from acrylic acid, which is the backbone of the polymer.

Although Redtenbacher discovered acrylics in 1859, it was Otto Rohm who conducted the major work beginning in the early 1900's. Dr. Rohm produced the first commercial acrylic in 1928.

In artists' acrylic paint the polymer is emulsified by surface acting groups - surfactants - in water. The acrylic is often mistakenly referred to as water soluble, when in fact water does not solubilize the acrylic at all. Surfactants permit dispersion of spherical acrylic solids in water. Without surfactants, the polymer would not disperse. Freezing vividly illustrates what occurs when water and polymer solids separate. A frozen, unprotected acrylic polymer takes on a cheesy appearance.

Dr. Otto Rohm

As water evaporates from a paint film during the drying process, the polymer spheres are drawn closer and tighter together. As the space between spheres decreases, incredible pressures arise. The effect of capillary forces results in the collision of acrylic polymer spheres. When the collision occurs, water and other volatiles are eliminated. The result is a honeycomb pattern of tightly compacted spheres. Solids, such as pigments, are trapped and bound in this honeycomb system.

We can thankfully continue our discussion of acrylics without reaching a complete understanding of the complexities of the mechanism of film formation. (Many of you are probably relieved at this point!) Suffice it to say, that the complex nature of the material posed many challenges to the early pioneers of acrylic paints.

Widespread Doubt at First

Sam Golden began experimenting with acrylics in the early 1940's. A pioneer in the artist paint industry, Sam had teamed up with Leonard Bocour in 1939. This was the period when polyvinyl and phenolic resins, the " ideal varnishes " of the 1940's had just made their disappointing showing. It was not a propitious time to launch a new line of acrylic paints, and predictably the materials were greeted with considerable skepticism.

Despite the widespread doubt, Sam began working with mineral spirits-soluble acrylic and developed the first acrylics for artists' use. This original paint was Magna, which Sam produced while at Bocour. Although Magna represented a breakthrough, it required continual experimentation.

Eventually Magna made it to the market and found uses in both conservation and in artist studios. Although improvements continued, the early acrylics did not gain a wide audience.

Beyond "Plastic Paint"

With the advent of acrylic waterborne coating[1] in the 1950's, several commercial artist paint manufacturers started testing and production of the latest "plastic paint."

Vestiges of that term still cling to artists' attitudes toward acrylics - particularly at a time when natural materials are held in esteem. Ironically, the durability and tendency not to degrade, as natural materials will, represent one of acrylic paint's greatest benefits.

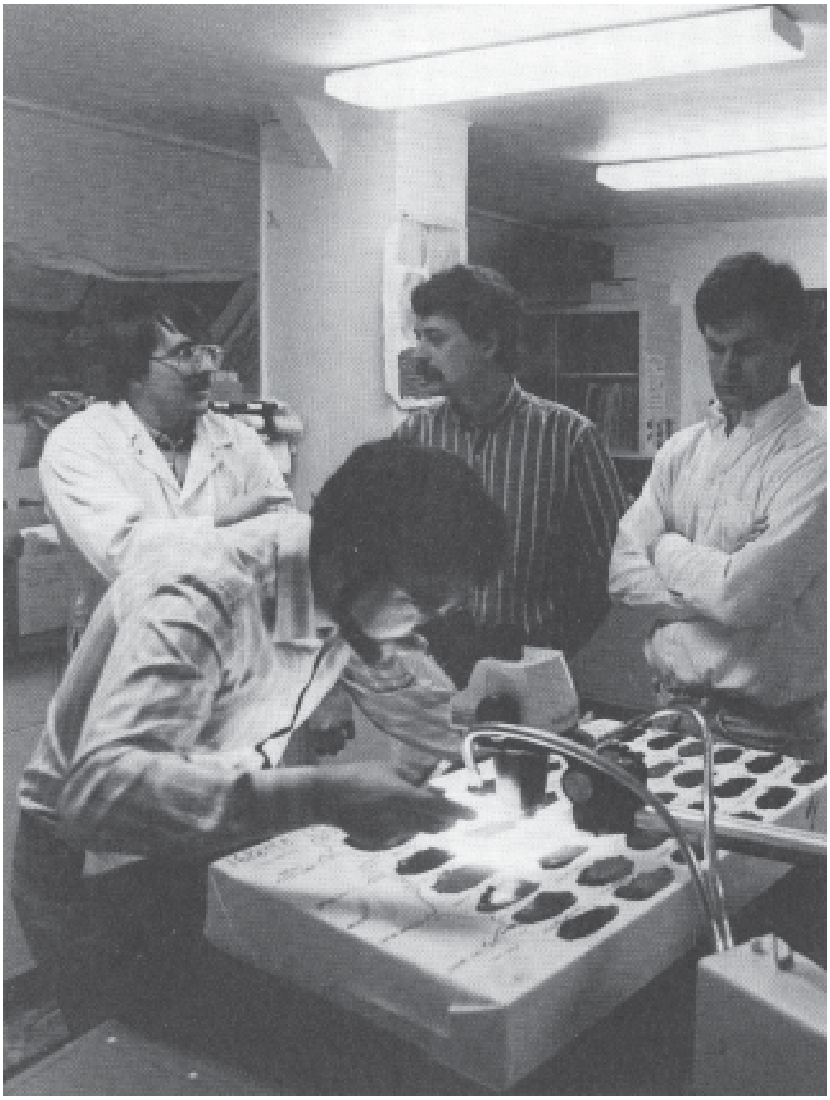
Indeed, if the first experimental acrylics sometimes fell short of expectations, they also demonstrated considerable advantages which in time would prove very appealing. Although inconsistency, color saturation, and limited color selection meant that the early acrylics were not an immediate replacement for oils, there was no denying the benefits; drying time, ease of clean-up.

Ease of use, among all the acrylic advantages, is the most apparent. Acrylics do not require the detailed and quite formidable techniques that are necessary with other media for preparing surfaces, laying colors over colors, estimating pigment drying times and using binder level.

The old shop in Manhattan in 1939,
(left to right) Leonard Bocour, Irwin Lefcourt,
Sam Golden, Alice Provenson, "Pigeon," Jack Wallace

The list goes on and on.

Acrylics are ready to use - immediately. This ease of use has enabled artists to extend the range of artistic effects; from thin stains to tremendous impasto, from watercolor to oil, from super gloss to dead matte. Without a doubt, all media work differently. But acrylics can be the most versatile and easy to use of all painting media.



The new shop in New Berlin in 1991, (left to right) Mark Golden, Jim Hayes, Ben Gavett, and Chuck Kelly.

Greater Artistic Control

The nature of acrylic paints is such that virtually every element of use can be readily controlled - gloss, texture, transparency, opacity, viscosity, flexibility, and drying time. A look at the unique character of acrylics can enhance that control.

A range of matting agents exists to flatten the finish of the acrylic from a chalky look to a fine satin sheen. These agents can be incorporated into the paints to produce an even tonal quality in a work.

Each Golden Acrylic has its own specific level of gloss. That's important to note, especially when an even matte or gloss surface on an entire painting is required. Golden Acrylics contain no matting agents[2], fillers, opacifiers, or extenders. Colors that tolerate larger pigment load will appear fairly matte; others, more reactive to such loads, appear fairly glossy. In every case, the colors are all pigment.

The artist should be the one with the option to add filler of any type. After all, it's a simple process to add a filler of any kind, but quite another matter to remove what's already been included!

In response to artists who have requested an even matte tone over an entire surface, we are now producing a full line of colors that contain a matting agent - Golden Matte Acrylics. We produce 8 different matting products to meet a variety of finishing needs.

We also supply several types of polymers for increasing gloss. This can be achieved by incorporating one of our gloss gels or polymer mediums.

Acrylics allow an artist greater control of texture. Acrylics can be smooth as cream or as gritty as sand; they can seem like silk, or pull like taffy. The artist can achieve many of these textures in the studio by adding marble dust, pumice, or other materials into the mix.

Golden has produced many mixes as custom items for artists who need a certain alteration, either in the surface or the working ability of the paints. We produce 12 different types of gels and molding pastes that offer a broad range of viscosities.

Adjusting for Drying Time

Controlling drying time is the concern most frequently raised by artist. With acrylics, drying time is related to the evaporation rate of water which is affected by temperature/humidity, and the rate of air current over the surface. Adding glycols to paints slows down drying time considerably. In moderate amounts, glycols will evaporate completely from the paint film, but at a rate slower than water. Retarders containing glycols are effective when applying a fairly thick coat, or when keeping paints wet on a palette over an extended period of time.

Applying thinner layers, by nature, increases the rate of evaporation - thereby speeding drying. Consequently, using any "wet on wet " technique can be difficult with acrylics. Under those circumstances, the artist can adjust in a number of ways.

One adjustment may be to use an atomizer to increase moisture at the surface of the paint (the first layer to dry). Another is to paint into a thick, wet gel coat. A third would be to add retarder. The choice is up to the artist. Using acrylics eliminates at least one compromising technique - blending by glazes. The paints dry so rapidly that no time is lost waiting for layers to dry. NOTE: If rapid drying presents a real dilemma to an artist who needs open time to work and go back into the paints - and who cannot develop a technique to allow for rapid drying - acrylics may not be the choice.

A Final Note on Drying

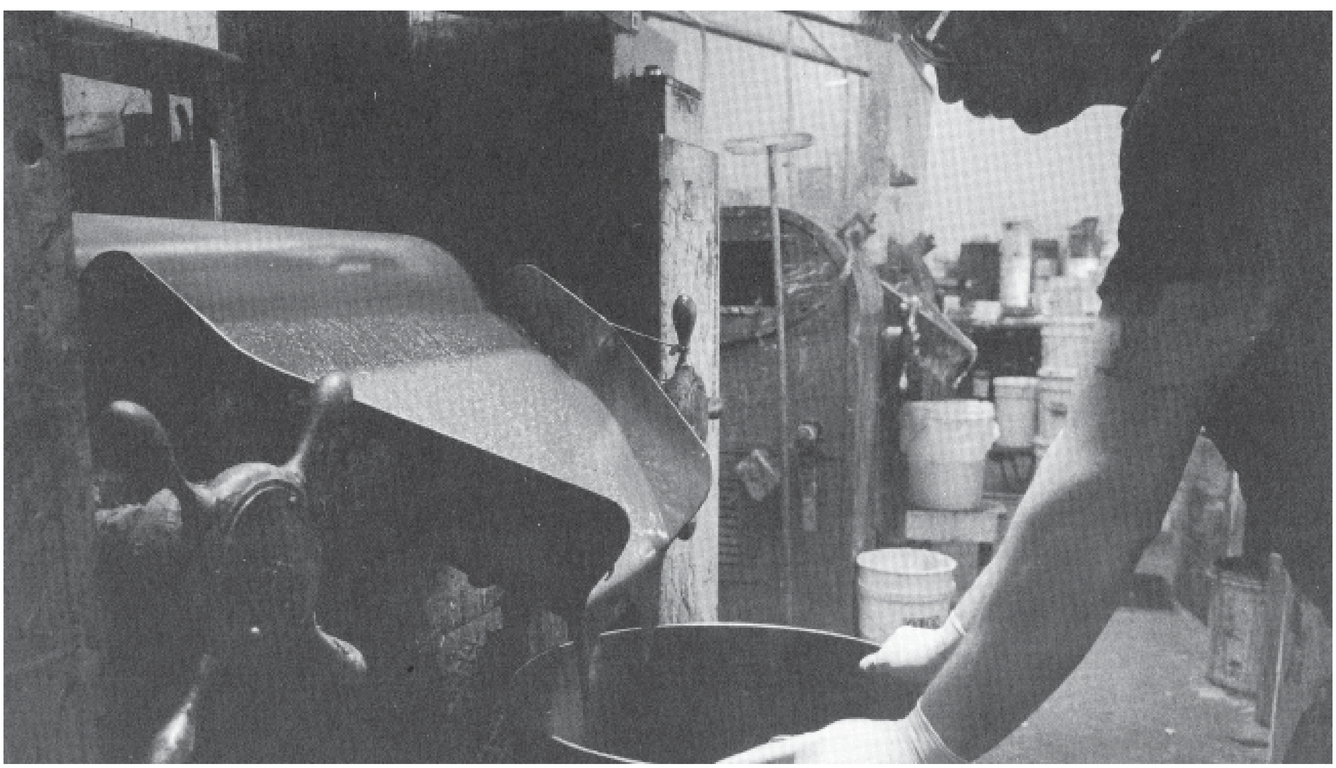
Acrylics appear to dry darker than when they are applied. Actually, the pigment remains unchanged. On drying the binder clears. That is, polymer medium or gel medium appears white before use and therefore tints the colors when wet. The milky white appearance is typical of all acrylic emulsions. The medium clears upon drying, so the colors will seem darker when dry. It is most evident on the darker transparent colors such as the Quinacridones.

We suggest the artist should look at this attribute before painting.

Enviable Durability

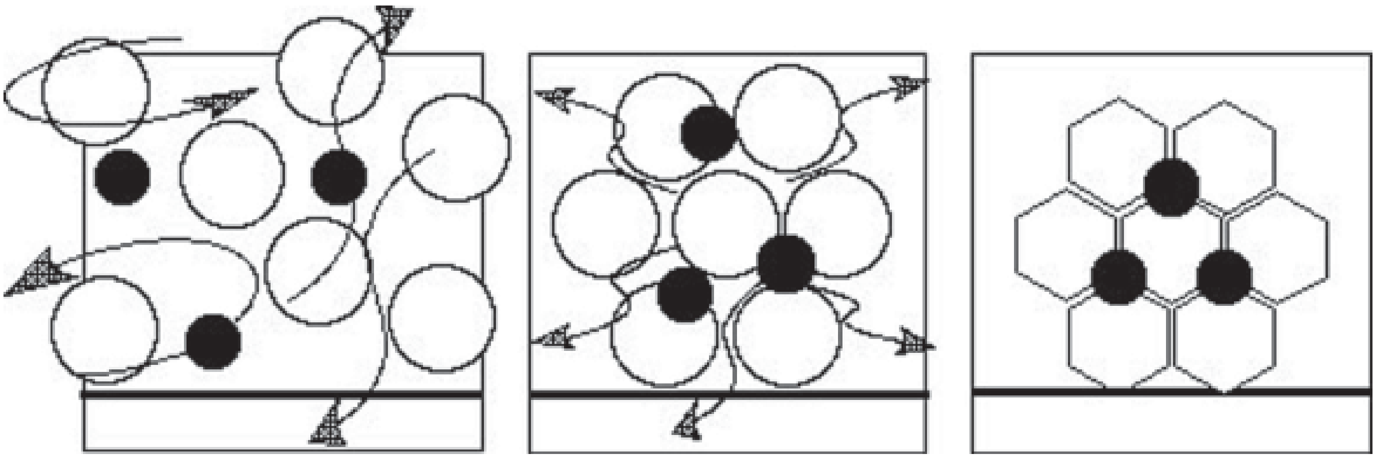
Acrylics may be among the most durable materials available. After one-quarter of a century, many still ask if acrylics will endure with time. Obviously it's still too soon to compare the durability of this new medium with more traditional paints under gallery-lit conditions over hundreds of years! Yet the accumulated data from many tests for aging conducted in the lab suggest acrylics will demonstrate a remarkable durability.

In identical laboratory controlled exposures to heat and light, acrylics do not exhibit many of the reactions of oils, which will turn brown - or take on what is somewhat elegantly referred to as " gold tone." Oils become brittle and crack, exhibiting "craquelure," and lose their flexibility and cohesion. These reac-tions, of course, are similar to those exhibited by the oils under normal



Rick Ashton grinds pigment during the milling process.

How Polymer Emulsion Traps Pigments



Step One
Water begins to evaporate into atmosphere and absorbant surface.

Step Two
Capillary action forces water out as polymers collide while forming bonds.

Step Three
Polymers bond and fall into hexagonal patterns. Clear, dry film traps pigment particles.

Acrylics can be made as " juicy" as oils or as flat and opaque as a goache. They can be built up and remain flexible, or thinned down in washes or glazes for beautiful transparencies. And acrylics are forgiving! What other paint allows the artist to paint over mistakes so rapidly!

conditions over time. Under the same levels of exposure, acrylics retain much more of their original characteristics and do not exhibit the many problems affecting oils.

Still Experimenting

Since Sam Golden's first experiments, many new questions about acrylic paints have arisen. Not only are we diligently addressing new questions, but we're constantly reviewing, reconsidering and researching the old, unanswered questions. In 1982, for instance, Golden Artist Colors created a permanent replacement for the fair-ly fugitive Alizarin Crimson - our Quinacridone Crimson. Recent work on a new UV (ultraviolet) stabilizing system will increase even further the ability of acrylics to last through the centuries.

Footnotes
1. Frequently called water-based
2. Except for matte colors

We'd like to hear from you, too - both your successes and your difficulties with acrylics. Perhaps there's a way we can help. Our goal is to offer the artist the freedom to concentrate on painting, not paint.

Further Reading

Acrylic Resins
Horn, Micheal B.
NewYork: Reinhold, 1960

Polymer: The Origins Of A Science
Moravetz, Herbert
New York: Wiley, 1985
See Chapter 1 for a discussion of the discovery and earliest work with polymers. Also information on origin of term "polymer."

Applied Polymer Science.
Tess, Roy W., editor.,
and Gary W. Poehlin.
Washington D.C.:
American Chemical Society,1985
See Chapter 54 for a brief general introduction to the application of polymer science in paint making.

Iridescent Mediums

Golden's Iridescent Mediums offer the artist an exciting range of colors and effects. To take full advantage of Iridescents and to realize the subtle differences in effect which can be produced, it's helpful to have a general understanding of their unique properties.

Iridescents are most familiar for their lustre quality. All of Golden's Iridescent Colors produce a lustre quality by themselves, with other colors, or mixed with mediums. Our line of Iridescents can be separated into three groups based on chemical composition.

All Interference Colors, Iridescent Pearl and Silver are in the first group. These colors are derived from mica plateletes[1] which are coated with an extremely thin layer of titanium dioxide. Refraction[2] and reflection of light at the titanium dioxide layers produce various colors and pearlescent effects.

Iridescent Gold, Copper and Copper Light make up the second group. These colors are derived from mica plateletes, but an iron oxide coating is present either in place of, or in combination with, a titanium dioxide coating. The iron oxide coating results in pigments which possess hues as well as pearlescent qualities.

A third group consists of colors derived from highly reflective metallic pigments. This includes Stainless Steel (Coarse & Fine), as well as, Micaceous Iron Oxide.

Lustre Arises from Layers of Pigments

The pigments in the first two groups (non-metallics) are composed of very thin, highly reflective and transparent plateletes. The plate-like shape allows the pigments to be easily oriented into parallel layers within the transparent medium. When viewed, a portion of the incident light will be reflected by the uppermost layer of pigments, while the remainder of the light will be transmitted and subsequently reflected by lower layers. It is this multiple reflection of light from many microscopic layers that produces the observed shimmering lustre or pearlescent effect.

Light Interference

A second property is at work in the Interference mediums. The phenomenom is light interference, which is most familiar to us in the rainbow effect created by a thin layer of oil on the surface of water. This phenomenon was identified by Thomas Young in 1801 in a series of investigations that were eventually instrumental in advancing the theory for the wave-like nature of light.

Whenever light strikes a boundary between two materials of different densities, the light will be either reflected or refracted (hence, transmitted). If the refracted light encounters another boundary between materials of different densities, this light will again either be reflected or refracted. This process continues everytime a new phase is encountered.

Light interference results from these concurrent multiple reflections and refractions of light. If the interference is constructive in nature, the light waves reflected from the different layers will be "in phase" and a strong color stimulus results. With Intereference colors, a specific thickness of the titanium dioxide layer (TiO_2) layer allows only a narrow band of wavelengths of light (representing a certain color) to be reflected in phase, while all other reflected wavelengths of light (colors) undergo destructive interference and are not observed. As these pigments are transparent, a portion of the light will be transmitted and the resulting color will appear as the compliment to the reflected color.

Maintaining Bright Surfaces: The Options

The highly reflective surfaces of the flake pigments used to produce Iridescent Mediums are extremely thin. Flake pigments range from 1 to 2 microns in thickness, and up to 80 microns in diameter. Consider that the surface of an average flake of Iridescent Pearl could carry over 50,000 Carbon Black pigment particles placed side by side. With this larger particle size inevitably comes a certain weakness in color strength.

Although no rule is absolute, some procedures for maintaining bright surfaces have proven their effectiveness. What follows is a brief review of some of the more successful approaches.

To maintain the brightest possible effects with Iridescent Colors, avoid mixing them with opaque colors. Similarly, matte mediums, and matte gels will also reduce iridescent qualities by scattering the light that hits the surface.

With Interference Mediums it's helpful to keep in mind that the phenomenon of light interference produces a unique color " flip" in these paints. An Interference paint reflects one color and transmits its complement. For example, in intense direct light, Interference Blue will reflect a lustrous bright blue color. In indirect light, the same paint will transmit its complement - in this case, a buff. This color "flip" is unique and varies according to the surface on which it's applied. Thus, on a darker surface, Interference Colors tend to be much stronger. To produce the brightest colors with the Interference line, add a small amount of black - 1:100 or less. The black will strengthen the reflected color. Add more black if darker colors are required.

Excellent Weathering Resistance

The mica used is quite insoluble in fairly strong acids or bases, and is not affected by water. Therefore, in combination with an exterior grade titanium dioxide and/or iron oxide, the paint is very stable and offers excellent permanency.

This resistant property distinguishes the Iridescent Mediums from other metal products, such as coppers, bronzes and even aluminum flakes. Because the metal oxide has already reached its most stable state of oxidation, there is little possibility for change resulting from further oxidizing reactions.

Some of our metals demonstrate remarkable durability. Our Stainless Steel (Coarse & Fine), which consists of extremely durable 316L grade stainless, is very resistant to salt spray and acid spotting, as well as alkaline cleaners or detergents. Other metals are less stable.-

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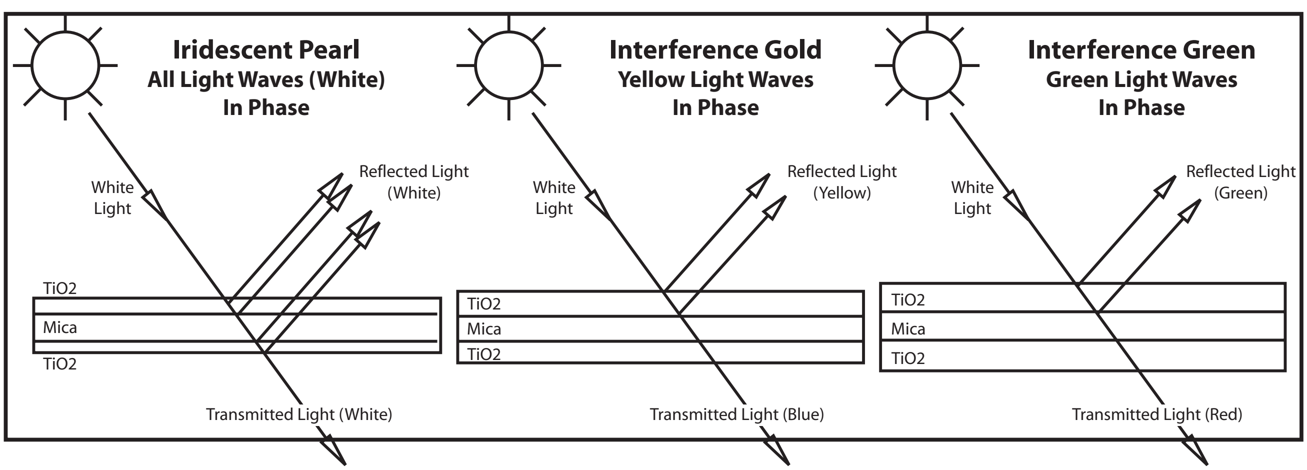
How Interference Color Pigments Work



In the manufacturing of the Interference pigments, the TiO_2 layer thickness is carefully selected and controlled to produce the desired color. In the case of Iridescent Pearl, the TiO_2 is sufficiently thin, such that all wavelengths are reflected "in -phase", yielding a white reflectance. For Interference Gold, the thickness of the TiO_2 layer results in the wavelengths representing yellow to be reflected "in phase", yielding a bright gold at specular angles, while those wavelengths representing blue are transmitted and are seen by the observer at diffuse angles. The same principles pertain to Interference Green.

While Golden's custom work includes mixing most any metal flakes as requested by customers, we do not recommend metal flakes such as bronze, for example, if a non-tarnishing film is desired.

Other Application Notes

As matte materials tend to reduce the lustre of Interference mediums, adding gloss materials, such as clear gloss gel or gloss medium, increase interference qualities.

Overall, thicker applications will cloud the paint and weaken the intensity of the Interference Colors. Thinner applications increase the interference qualities. As the level of dilution increases, the pasty look disappears. Applying thin layers, whether by wash or glaze, effectively forces particles to lay flat with the large broad side facing the viewer. As more particle surfaces are exposed, the shimmer or lustre increases.

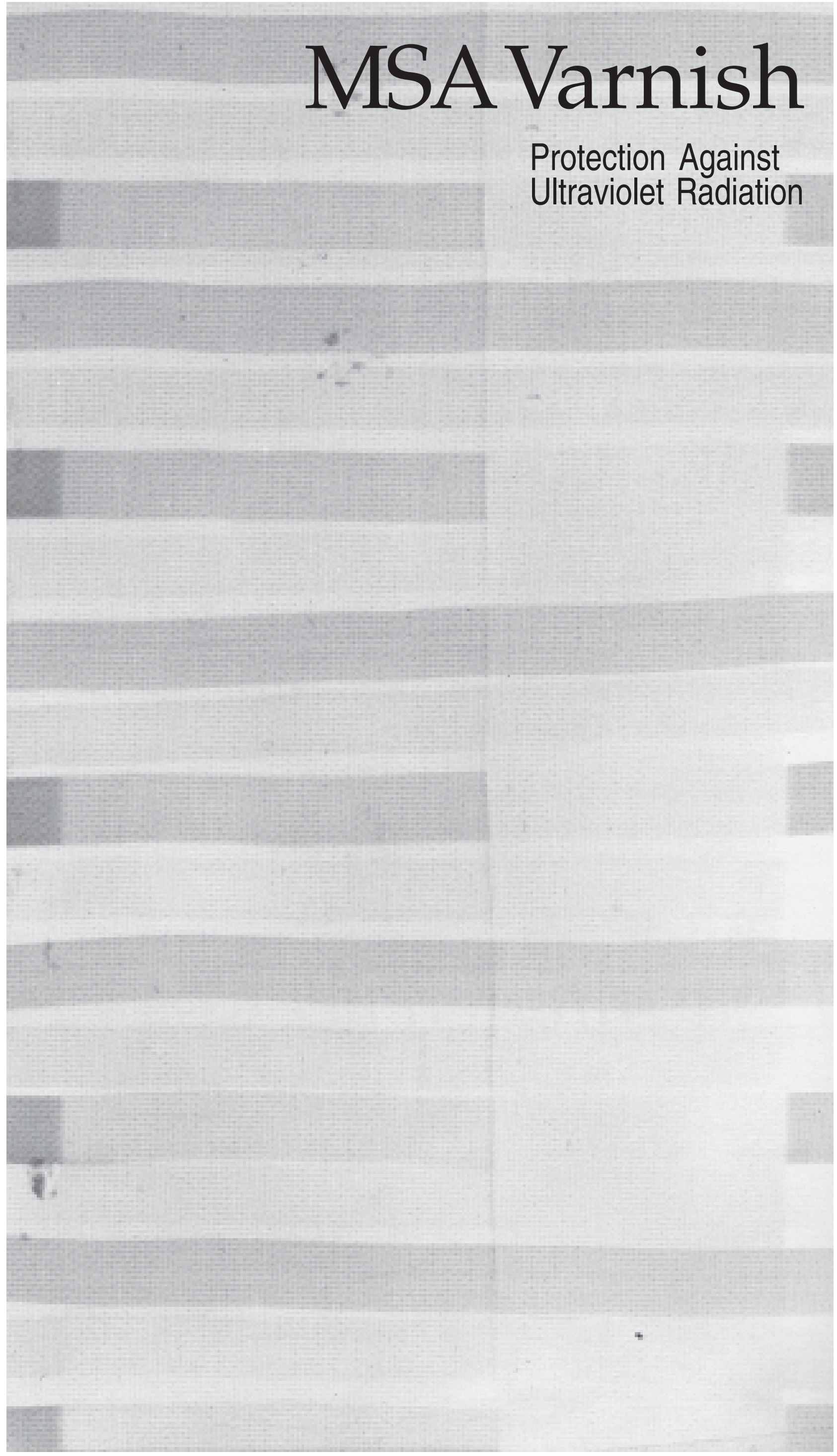
To avoid streaking or to achieve an opaque coat, it's best to lay down a base coat that matches the non-reflective color of the Interference Color. For example, when using Interference Blue use a very pale buff color as a base coat. Or, if combining another color with an Interference Blue, use that color (preferably mixed with white) as a base coat.

This information should provide initial understanding of Iridescent and Interference Mediums. The important point is not to stop at face value. They can be as useful to a palette as white and can provide a range of colors and effects never before available.

Footnotes

1. The mica consists of an aluminum silicate, which has a crystalline structure that permits easy cleavage into very thin plateletes.

2. Refraction is the change in direction of a light ray passing from one medium to another of different density.



TEST RESULTS

The center block is the UV- exposed test area.

LEFT: Magic marker, various colors and brands shown with MSA Varnish with UVLS applied.
RIGHT: Same products shown without MSA Varnish with UVLS.

For its versatility and exceptional filtering properties, the Mineral Spirit Acrylic, (MSA)Varnish with UltraViolet absorbers and hindered amine Light Stabilizers (UVLS), promises to be the prototype for varnishes of the future.

Golden's MSA Varnish with UVLS was developed in 1984 and has already proven itself in a variety of uses - sometimes under extraordinary circumstances. It has been used on an exterior wall of marble in the Middle East and on a wall of overlaid plywood in Alberta, Canada. It's been applied to surfaces ranging from paper to magnesium.

Less of Sun's UV Effects

The MSA Varnish is produced from acrylic thermoplastic resins (isobutyl methacrylate and butyl methacrylate.) Instead of the usual emulsion polymer, which produces a milky color, a solution polymer is used. The result is a clear appearance when wet. The MSA Varnish also contains a system of UV light filters which reduces the harmful effects of the sun's ultraviolet radiation, as well as UV radiation from other sources.[1] This is the first time such a feature is available in a varnish for the professional artist. The varnish forms a tough film which is less permeable than typical emulsion varnishes. This tougher surface significantly reduces dirt penetration and increases mar resistance.

As a solvent borne system, the varnish suffers less from foam production and pin holes that can detract from the finish. The reduced surface tension of mineral spirits also allows the varnish to produce an extremely level film.

Thin Applications are Best

MSA Varnish is being used successfully on a variety of surfaces. The photograph illustrates the varnish's effectiveness as a UV filter when applied over both color pencil and magic marker. Although as a UV filter the varnish tends to reduce the initial brightness of fluorescent colors, it has been shown to successfully slow down the degradation of fluorescent pigments. It's also been used with very good results over acrylic films and oil paints.

The varnish is supplied with 33.5% solids, which makes it suitable for brushing. To lessen brush drag, thin the varnish with up to equal parts of mineral spirits. If spraying, reduce varnish with equal part mineral spirits. As the varnish is thinned, more coats may be required to achieve sufficient protection. Apply the varnish only on a completely dry surface, using a clean bristle brush.[2] Work in small areas at a time, brushing first in one direction , then in a direction perpendicular to the first. When applying multiple coats, it's helpful to avoid overworking the varnish. Allow for extended drying times before applying additional coats, especially when the varnish is thinned with mineral spirits.

A tougher surface, a greater ability to slow degradation of fugitive materials, and removability distinguish the MSA Varnish from earlier formulations.

Thickness of application, of course, can affect drying time. Temperature, humidity, solvent level and surface absorbency also can determine the time required for drying. Thus, one coat may require anywhere from one to six hours to dry.

Improved Cleanup

Cleanup can be made easier, too, by using mineral spirits. The MSA varnish is soluble in most hydrocarbons - toluene, xylene, VMT naptha, and mineral spirits.[3] It is also a reversible product[4], and mineral spirits is clearly the solvent of choice.

Remember, although mineral spirits is one of the safer solvents, proper ventilation should always be maintained when working with solvents of any kind.

MSA Varnish with UVLS offers new capabilities to the professional artist. At Golden Artist Colors, we're constantly putting MSA Varnish to the test on many different surfaces under varying conditions to gauge the results. We welcome all comments on the effectiveness - and limitations - of the varnish.

Footnotes:

1. The varnish is most effective in the wavelength range above 300nm. Below this, the protection drops off fairly rapidly. The atmosphere's ozone layer blocks most radiation below 300nm, yet some artificial sources of ultraviolet radiation do fall below this range.
2. Mark Grottsegen's book, Manual of Painting Materials and Techniques, provides an excellent description of varnishing techniques. It is the most complete and up to date text of artist methods and materials we have seen.
3. MSA Varnish is also soluble in esters such as ethyl acetate; cellosolve acetate; and some chlorinated hydrocarbons.
4. The varnish releases solvent for about 3 months until completely cured. During this time the film can be removed fairly easily. After this cured time period when the film is completely coalesced removal will be more difficult.