E-SQUARED MAGAZINE

ART + SCIENCE


"The artist, like the scientist, has a crucial role to peform in our society: to see things differently, act on this vision, then report the failures & successes."
– John Sabraw

FEATURED ARTIST

JOHN SABRAW

from acid to art

The use of pigments has been documented as far back as prehistoric times. Spanning painting on cave walls to bodily decorations, these colorants were typically derived from animals, plants, and minerals. Earthy yellows, reds, and browns were often created from minerals found in the clay and soil. More uncommon colors like blue and purple were made from stones like lapis and even mucus extracted from sea snail species, often attributing these colors with royalty due to their rarity.

Though a popular facet of humanity's artistic history, mulling pigments from natural resources has nearly been brushed over by the invention and use of artificial resins for manufacture in the commercial paint industry. Searching high and low for a legitimate pigment maker in our modern day might yield a few results, but activist and environmentalist John Sabraw sets them all apart. So, where exactly can you find him? Where the highest concentration of coal-burning power plants are located: Ohio. Visiting Ohio's heavily polluted mine sites, he intercepts toxic drainage before it reaches nearby streams, extracting iron oxide from polluted waters to use in pigments that he mulls by hand.

The perfect confluence of science and art, John Sabraw sets out to generate a body of work that carries a message regarding the toxic landscapes that we are all tied to, whether we choose to recognize this as our truth or not. Even more important though, he bears a brightly shining torch, leading us along a path of sustainability towards the future, reminding us of how we can tackle the beast of industrial outcomes with great innovation.

E2: HOW DID YOU COME INTO TURNING TOXIC SLUDGE INTO PIGMENT?

JS: When I moved to Ohio, I was in a sustainability immersion group called "Kanawha." As we toured southeastern Ohio, I was struck by local streams that are not only devoid of aquatic life, but are orange, red, and brown – as if from a mud slide upstream. The colors were mainly from iron oxide – the same raw material used to make many paint colors. Seepage from abandoned coal mines had caused the water pollution.

I thought it would be fantastic to use this toxic flow to make paintings rather than with imported iron oxide. It turned out that environmental engineer and fellow Ohio University professor Guy Riefler had already been working to create viable paint from this toxic sludge; so we began collaborating.

E2: CAN YOU DESCRIBE YOUR MOST RECENT BODY OF WORK, UNEARTHED TOPOGRAPHIES?

JS: We've made pigments with quality hue, lightfastness, stability, grind, transparency, and feel, but we also needed an expressive visual that told the pigments' story. So I began to use the pigment to make circular paintings that express the sublimity of nature but also the fragility of our relationship with it. All of my paintings use these toxic pigments in combination with standard artist colors.

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Previous spread: Detail of *Chroma S3*. 2015. Acid Mine Drainage (AMD) and other pigments.
Current: John Sabraw mulling pigment. Next spread: AMD site in Carbondale, Illinois. 2016.

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Everything is intertwined. The streams these pigments come from connect to other streams, rivers, and eventually the ocean. This might seem a local issue, but it is not – it is a global issue. One can isolate and examine moments on a micro scale, but if you pull back, you can see that they all connect in a wholly-interdependent macro system. That's what my work is about. I have chosen to examine and explore each of these micro events to help me to better understand my connection to everything else and what I can do to benefit the whole system.

For me, environmentalism and sustainability are intrinsic to our presence within the system of Earth and the universe at large. These terms define a philosophy of Resonance, the butterfly effect, cause and effect – so we need to do the best possible action in moments and situations where we can have positive effect. If I have an opportunity to make a positive impact here, am I not charged with the responsibility to do whatever I can for the benefit of all?

E2: BY NOW, MOST OF US ARE FAMILIAR WITH COAL MINING, BUT WHAT EXACTLY IS ACID MINE DRAINAGE?

JS: Strip mining and room-and-pillar mining were common throughout southeastern Ohio in the first half of the twentieth century. Forests were clear-cut, soils scraped away, and tunnels dug to remove the coal. By the 1970s, most of the mining companies had moved on, leaving behind open mines and disturbed land, with inadequate restoration.

Much of the forest has now regrown, but the underground mines continue to release toxic water into streams. When abandoned, many of the mines fill with water, and the oxygen and water react with mineral surfaces that have been buried for 300 million years. When sulfides are present, common in Appalachian coal deposits, very high concentrations of sulfuric acid and iron are produced. This damages over 1,300 miles of streams in Ohio alone.

E2: FROM THE FIELD TO THE LAB, CAN YOU SUMMARIZE THE PROCESS INVOLVED IN THE DEVELOPMENT OF A PIGMENT?

JS: The pigments are found near the Ohio River in the southeastern part of the state, which has the largest concentration of coal-burning power plants in the world. Scattered over thousands of square miles are innumerable, abandoned, underground coal mines. Rainwater seeps into these caverns and becomes contaminated with toxic levels of heavy metals. This water then flows out into streams and rivers, turning them yellow, orange, and red as the metals oxidize.

The idea is that we intercept the toxic acid mine drainage before it gets to the stream, neutralize the acidity, extract the iron oxide, and release the clean water back into the stream. When it initially comes out of the mine seep, the toxic drainage is actually clear, but it contains dissolved iron oxide that can be extracted to make pigment. After taking the water back to the lab, we neutralize it with sodium hydroxide or another base. Then we bubble oxygen through the water, which causes the iron oxide to crystalize and fall to the bottom. The clean water can then be returned to the stream.

When iron oxide separates from water, it's a muddy sludge that we can dry and grind into a useful pigment. We collect this and blend it with acrylic polymers and resins to make acrylic paint and with drying oils to make oil paint. Colors range in hues from yellow to brown to red to black, which are achieved by firing the pigment at different temperatures – up to 2,000 degrees Fahrenheit – in a kiln at Ohio University's ceramics studio.

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"Most of the conflict, injustice, and devastation in the world can be traced back to supply and demand related to abuse of natural resources."

E2: DO YOU PLAN TO DEVELOP YOUR PIGMENTS COMMERCIALLY?

JS: We're working on producing the pigment on a commercial scale. We're also building a pilot facility that will not only demonstrate the process on a small scale, but will also serve as an immersive, educational installation.

Our plan is to encourage manufacturers to replace imported pigment with our Acid Mine Drainage (AMD) pigments. Our hope is that state agencies will use the products from manufacturers that use our pigment exclusively, as its creation will be doing the state and citizens a great service. Revenue from sales of the pigment will fund the continued remediation of the polluted streams. The day a stream's remediation begins is the day it starts going back to health versus remaining an aquatic dead zone.

E2: WHAT DO YOU HOPE TO ACHIEVE IN THIS PROCESS?

JS: With this creative solution to an environmental issue, we will achieve several things. In creating a viable product from contamination, our process provides a closed loop. We've made it possible to restore the streams from their own clean-up. By implementing renewable energy sources in the process, it should emit only very small amounts of greenhouse gases; no other sources of pollution will be made. In addition, this project will employ more people doing good for the environment and can serve as a model for future environmental clean-up solutions.

E2: NOW THAT WE HAVE ESTABLISHED THE ORIGIN OF YOUR PIGMENTS, WHICH IS AN ART FORM IN ITSELF, CAN YOU SUMMARIZE THE PROCESS INVOLVED IN ACTUALLY CREATING YOUR PAINTINGS FOR *UNEARTHED TOPOGRAPHIES*?

JS: Once the pigment from the toxic sludge is made into paint, acrylic or oil based, it is used as any other paint would be. I paint the "Chroma" series by starting with a composite aluminum panel that's held steady and flat with a steel jig, then I draw a circle on the surface. I brush and pour various water-based resins and mixtures that include different pigments. I build the surface very slowly but it must stay wet. When the first phase is done, the water and pigment form a bubble held together only by surface tension – like a bead of rain on a waxed surface. At this point the painting looks like a primordial pool that morphs and shifts like an oil slick on wet pavement. I add more and more until right before the mass will break the surface tension, and if that surface tension breaks, the whole thing will burst, so I often use an eye dropper towards the end to closely administer each and every drop.

When that delicate balancing act is complete, I cover the whole thing to keep dust and insects out and then let it dry for weeks until the liquid evaporates and the temporal, fluid image remains. The end results are unpredictable, and the materials and process allow for infinite variations and beautiful combinations.

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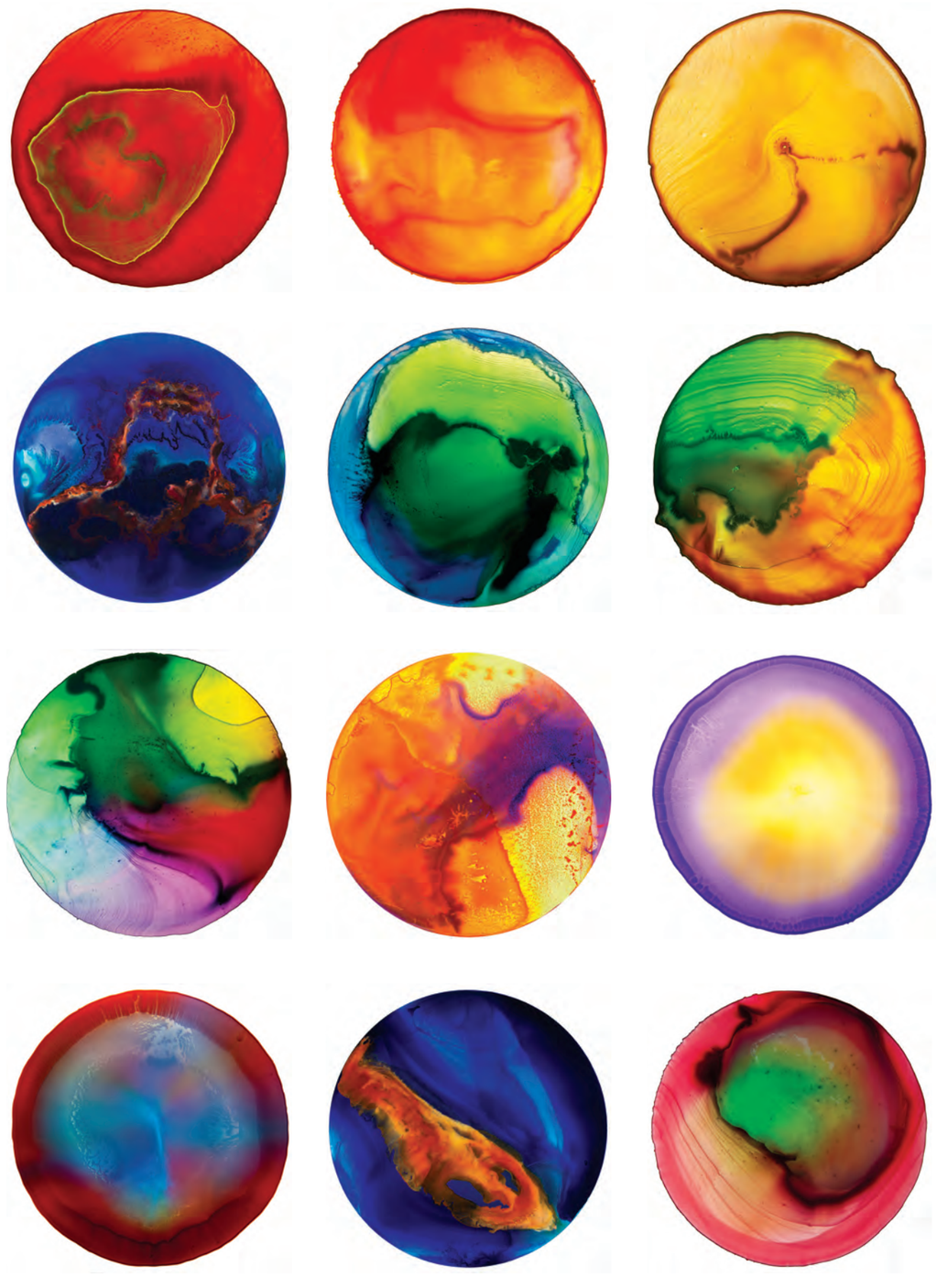
Detail of *Chroma S4*. 2017. Acid Mine Drainage (AMD) and other pigments. 48 x 48 in.



Above: Various Chroma paintings from *Unearthed Topographies*. 2017. Acid Mine Drainage (AMD) and other pigments. Various sizes.
Top Right: John Sabraw with AMD in hand. Photo credit:

ACTIVIST, ENVIRONMENTALIST, & ARTIST

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E2: DO YOU FEEL AS THOUGH THERE IS SOME CROSSOVER BETWEEN YOUR RESEARCH AND STUDIO PRACTICE?

JS: Artists and scientists share two critical aspects: curiosity and failure. Both are endlessly curious, try new things, and fail often. But that failure does not dampen their curiosity. The artist, like the scientist, has a crucial role to perform in our society: see things differently, act on this vision, then report the failures and successes. However, each have different constraints. Where the scientist typically has tightly-focused research goals, the artist has few limits and can often see methodologies from a more creative vantage point. But where the artist has broad conceptions, the scientist has depth of knowledge to implement and is more aware of specific problems that need to be solved. So rather than keeping disciplines and tasks divided, artists and scientists should collaborate in a more organic fashion. In some cases, the artist's role is to break down conventional methods so that science can make leaps. They can also help scientists make information more compelling so that it generates awareness, cultivates support and helps the general population feel that they are a part of scientific progress.

E2: AS A RESULT OF ANTHROPOGENIC IMPACTS, MANY OF THE WORLD'S ECOSYSTEMS HAVE UNDERGONE SIGNIFICANT DEGRADATION – ALTERED ECOSYSTEMS ARE OBVIOUSLY OF CONCERN. WHAT ARE SOME WAYS YOU FORESEE THE RESTORATION OF OUR TRANSFORMED LANDS?

JS: Most of the conflict, injustice, and devastation in the world can be traced back to supply and demand related to abuse of natural resources. Artists should use whatever is in their power to push for greater responsibility, positive change, and sustainability. In addition, collaborating with activists and organizations has the potential to activate those who are apathetic.

E2: LAST, BUT OF GREAT RELEVANCE: DO YOU THINK THAT "CLEAN COAL" EXISTS?

JS: Any mining of natural resources will have negative impact on the environment. It's arrogant for mining companies and government entities to assume that destroying miles and miles of land and waterways will be just fine because plants will return, or a mine can be sealed. Biodiversity is unlikely to be restored. The contamination of waterways will occur no matter how well mining companies think they sealed a mine – water will always find a way in and a way out.

In other words: there is no such thing as clean coal. We need to move to renewable resources immediately. We have the technology and money, but do we have the political willpower?