Sculpting Science
a provocative fusion of science and art
At the intersection of art and science

During the spring of 2014, Robby Roberson, professor with ASU School of Life Sciences, and Susan Beiner, professor with ASU School of Art, began a collaborative study to examine ceramic surfaces at high resolution using scanning electron microscopy (SEM).

Their hope was that these interactions would result in ongoing exchanges of positive and synergistic ideas, creativity and knowledge to produce provocative and aesthetically pleasing works of art that would be displayed within the School of Life Sciences and the School of Art. They also hoped to enrich the lives of ASU students, faculty and the greater community.

Because of this unique partnership, undergraduate and graduate students created 13 original ceramics pieces based on inspiration from detailed microscopic images of everything from pigskin to pollen to insects. These original works of art provide an unusual and creative look at what the human eye cannot see.

Acknowledgements

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On the cover: Shiyuan Xu
Through the Lens, porcelain, 13 x 25 x 11 in., 2015

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ASU School of Art: art.asu.edu
ASU School of Life Sciences: sols.asu.edu

sols.asu.edu/news-events/sculpting-science
Trisha Burrough has been working in the visual arts since 1991. While working as an interior designer, she found herself drawn to clay. She has spent the last several years developing and nurturing her skills as an artist, first at the Flint Institute of Arts in Michigan and now at ASU. It was a natural transition for her to continue to combine color, texture and pattern. Today she uses clay as her primary language to express her appreciation for the beauty in nature. With the use of the earth’s elements, Trisha has developed a love for taking a piece of earth and creating something that is part material, part energy, and part of her. She hopes to use her art as a way to empower others.

What subject did you use with microscopy to inspire your work?
Artful Blight is inspired by the results of looking at a piece of cloth from the studio with microscopy. This cloth is used in our process. I was drawn to the idea that it is already part of something we use every day. With the use of microscopy we can see that there is much more going on. The calibration gives us a much broader perspective and reinforces the connective nature in all things.

What do you hope people will experience when they see your artwork?
My hope is that there is an understanding of the connectedness between all things. Everything is not as it seems.

What part of this project was most rewarding or challenging?
Working in clay is a great parallel to life. You can start down one path with a plan, but there are always adjustments to be made and new things to learn. It can be constant recalculating. Constant adjusting.

What do art and science have in common?
I think for many of us artists, the process or journey is as important as the outcome or destination. This may be what art has in common with science. We are both looking to our process for answers.

What can scientists learn from artists, and what can artists learn from scientists?
With the help of science we can help expand the idea of what art is. Exposing more of the beauty in nature.

Spherical spores with ornate surface details produced from a mold growing on decaying fabric. Small, thread-like fungal cells (hyphae), large fabric fibers and the fragment of an unknown mineral (rectangular structure) can be observed.

Micrograph was taken at a magnification of 5000x.
Scale bar = 5 micrometers (0.005 millimeter).
Melissa D’Orazio

If Melissa could write art a love letter, she would. Since childhood, art has been and will always be her passion. She enjoys experimenting with her art often and continues to explore new media whenever given the chance. Although her specialty lies in watercolors, she enjoys the visceral and emotive nature of clay and as a result, creates a unique and detail-oriented style of clay building. A purist when it comes to art, she enjoys working with tactile, hands-on materials. Melissa believes that art is the greatest human invention ever created.

What subject did you use with microscopy to inspire your work?
I used the surface of glass. The image of this felt highly developed and intricate to me, so much so that I wanted to create a place for that image to live in my piece. I really love that it is such a strange, other-worldly image so in response, I worked to create a similarly strange piece out of clay!

What do you hope people will experience when they see your artwork?
I hope that they feel a sense of comfort in my work. I would like them to enjoy looking at the little details in the piece. This piece is best viewed up close and personal!

What part of this project was most rewarding or challenging?
The small intricate parts of the piece were absurdly fun to create. I enjoyed that way too much! The glazing was most challenging for me. I had no idea that this piece would become that strange color. Thankfully, I learned to appreciate that unpredictable aspect of the piece over time.

What do art and science have in common?
I believe that science in itself is an art. Passionate innovators tirelessly working and problem solving to achieve something revolutionary, learning and trying new things along the way: I think that phrase can be applied artist and scientists alike!

What can scientists learn from artists, and what can artists learn from scientists?
I think that scientists can learn through our tenacity. Most artists are very resolute, self-assured, and stubborn. The ability to stand alone against criticism has served to create many revolutionary people. That being said, I think that scientists could teach us to be a bit more humble. I admire the ability scientists have to work with each other and create things they never would have been able to accomplish on their own!

Melissa D’Orazio
Open Wide, porcelain, 2 x 12 x 9 in., 2015

Bachelor’s of Fine Arts (Painting)
Expected year of completion: 2016
Description of featured piece: Small and full of intricacies, earthy in color!
A series of small furrows along the surface of glass show minute angular and linear details. Micrograph was taken at a magnification of 500x. Scale bar = 50 micrometers (0.05 millimeter).
Carli Giese is a ceramic artist from Chandler, Arizona. She is working towards her BFA in ceramics at Arizona State University and plans to graduate in the fall of 2016. This semester Carli is studying abroad at the Pottery Workshop in Jingdezhen, China.

What subject did you use with microscopy to inspire your work?
I used a bug with the microscopy to inspire my work. I found it (dead) in the kiln yard at ASU and was mesmerized by it. I knew anything I chose would produce amazing images under the microscope just based off of what I had already seen done by others and I thought a once-living creature would be an interesting specimen. The metallic green color is what drew me in and even knowing I wouldn’t see that under the microscope I went for it. The images looked nothing like the bug itself, other than that they were beautiful in sort of a creepy way and I tried to grasp that same feel with the piece I created.

What do you hope people will experience when they see your artwork?
I hope people have a similar experience or feeling to the one I had when I found the bug in the beginning of this whole processes.

What part of this project was most rewarding or challenging?
The most rewarding part of this project was seeing my piece finished and it looked like what I had envisioned.

The most challenging part was interpreting the images and deciding what I wanted to make from them. I couldn’t decide if I wanted to base the piece off of the way the images made me feel, or create something that looked similar and/or exactly like them. The beginning stages were definitely the most difficult for me.

What do art and science have in common?
Art and science both generally intrigue people. They go together in more ways than one and I think there is so much beauty to see in both fields of study.

What can scientists learn from artists, and what can artists learn from scientists?
Artists can really learn from and be a voice for scientists. We can really learn to observe, be patient and realize that results are not always as we expect them to be. I also think that everyone prefers to look at things in a particular way and everyone approaches certain topics differently. I believe that many artists really bring what scientists are trying to say to a different subgroup of people who don’t necessarily know much about science or care to sit in a classroom to learn about it. Scientists can learn new ways to observe and interpret what they are looking at. For example, the way all of us in the ceramics studio have looked at these images taken under the microscope and turned them into something completely different.

 Bachelor of Fine Arts (Ceramics)
Expected year of completion: 2016

Description of featured piece:
The clay I used was B-mix with sand fired in Cone 10 Reduction.
The body of the piece was glazed with a recipe I developed in Susan Beiner’s glaze chemistry class at ASU in 2014. I chose to base this piece off of the way the images made me feel as well as incorporate some texture I took straight from the images themselves.

Repeating hexagonal pattern across the surface of an insect (beetle).

Micrograph was taken at a magnification of 2300x.
Scale bar = 10 micrometers (0.01 millimeter).

Carli Giese

Untitled, stoneware 19 x 24 x 20 in., 2015
Elliott Kayser grew up in the Northwest but spent the last five years living in Ann Arbor, Michigan, which is now considered home. Mesmerized with clay starting in the fourth grade, Elliott continued to pursue ceramics for his undergraduate degree at Alfred University, and now for his Master’s degree at ASU. Much of the inspiration for his work comes out of studying American culture, ecology, and economics. By reflecting on what defines us as a society, he hopes to gain a better understanding of what it means to be American, and what it could mean in the future.

Description of featured piece (*Freudian Tea Leaf*):
When looking through microscopic images of familiar objects for this project, the abstracted magnification challenges definition. The interpretation of what people see becomes more interesting than the actual source image; reflecting the consciousness of the observer, in much the same way as a Rorschach test reveals clues about the psyche. In the spirit of Freud, and his fascination with orifices, I interpreted the magnified texture of a tea leaf for what I saw as a field of tongues, disconnected from any bodily form.

What do you hope people will experience when they see your artwork?
When viewers look at this sculpture I hope they begin to compare and contrast interpretations about what they see in its abstraction. Being stuck somewhere between revulsion and discovery.

What part of this project was most rewarding or challenging?
I enjoyed watching the overall sculpture take shape as each tongue was modeled and attached. Figuring out how to display this work was challenging and fun.

What do art and science have in common?
Art and science both lead to discovery, creating new lenses to view the world through.

What can scientists learn from artists, and what can artists learn from scientists?
Scientists can learn to think outside the box from artists; try something out of curiosity, especially when you don’t have a hypothesis. Artists can learn to utilize new technologies that will inspire new avenues of exploration from scientists.

Elliott Kayser
Above: *Freudian Tea Leaf*, terra cotta 11 x 20 x 11 in., 2015

Master’s of Fine Arts (Ceramics)
Expected year of completion: Spring 2017

Air-dried sample of the surface of a leaf. Individual cells are artificially flattened with ridge-like features due to the removal of moisture.

Micrograph was taken at a magnification of 1000x. Scale bar = 20 micrometers (0.02 millimeter).
Hakyoung Kim has been interested in relationships between existences. In addition, her art idea is based on oriental philosophy, and she has tried to combine the Eastern philosophy with Western style on her art works. Therefore, she always makes an effort to get a different perspective and inspiration from various environments.

She has a very proactive attitude. In the process of her making artworks, she would not give up or despair, but rather endeavor even harder to overcome the difficulties. Hence, she is always looking forward to seeing her art.

What subject did you use with microscopy to inspire your work?
Green leaf bottom surface and stem. I felt a big difference between the images in the microscope and the images I expected when I saw them with my eyes compared with others. Additionally, I thought it would be interesting if I combined a two-dimensional image from the surface of green leaf with a three-dimensional image from the stem on my ceramic piece.

What do you hope people will experience when they see your artwork?
When people see my artwork, I hope they feel a life from my pieces and imagine that different kinds of existences are connected to each other. I want them to think that they are not individual existences, but connected in one big existence and have the sense of belonging together.

What part of this project was most rewarding or challenging?
It was challenging to make new patterns from microscope images because I haven’t tried to put three-dimensional patterns and two-dimensional patterns together on one piece before. I had to connect these patterns naturally. In addition, it was fun to add the colors to a black and white picture.

What do art and science have in common?
Both of them can be used for peaceful purposes and at the same time dangerous purposes. Art is instrumental in changing people’s thoughts and science also has significant influence on their life. Artists and scientists always have to keep in mind the result they might make.

What can scientists learn from artists, and what can artists learn from scientists?
Both scientists and artists discover and create subjects they concentrate on. They look different, but their method of approach and process resemble each other. Therefore, they can learn from each other by getting universal and personal perspectives.
Liz Lohr is an artist and educator from Brooklyn, NY. After working and teaching in community centers and after school programs for over 10 years in lower Manhattan, she moved to Tempe, Arizona in the fall of 2011 to pursue a Bachelor’s of Fine Arts in Ceramics at Arizona State University. Her work investigates the history and conceptual properties of the ceramic vessel as it relates to everyday life and has the capacity to engage multiple functions and perspectives. Lohr’s work has been shown in the Harry Wood Gallery at ASU, the Livery - a residency space through Scottsdale Public Art, and The Gallery at Phoenix Center for the Arts. Her collaborative works have been shown at ASU’s Digital Culture Gallery, and Combine Studios in downtown Phoenix.

What subject did you use with microscopy to inspire your work?
I chose to use an orange sulphur butterfly as my subject. Butterflies symbolically relate to themes of death/life and transformation, and are mostly ephemerally experienced, which are concepts I explore in my work. I had the opportunity to listen to a lecture by and subsequently meet with Dr. Ronald Rutowski with the School of Life Sciences, who studies the physical production and evolutionary change of butterfly coloration. He explained to me the physical structures through which light is filtered, is absorbed by, and reflects to create the colors and patterns our eyes see in a butterfly’s wing.

What do you hope people will experience when they see your artwork?
I hope viewers will enjoy how this object relates to looking more deeply at what we think is familiar in our environment.

What part of this project was most rewarding or challenging?
The most rewarding part of this process is seeing two departments that aren’t normally considered comparable working collaboratively to share their work with a public audience. Working with a new medium, wood, was especially challenging for me.

What do art and science have in common?
The two disciplines share a commitment to looking critically, to investigate and observe phenomena in depth and from multiple perspectives. The practitioners of both also act as a link in the chain of the greater disciplines’ achievements. We learn from those that came before and work to extend the understanding for those who will come after.

What can scientists learn from artists, and what can artists learn from scientists?
I think artists can help scientists envision more than one method of communicating their ideas and practices. I think scientists can help artists identify important issues, especially environmentally, and make work that is relevant to the world we live in.
Hans Miles

The Block, stoneware, 5 x 11 x 14 in., 2015

Hans was born by a river, in a little tent. Just like that river, he’s been running ever since.

What subject did you use with microscopy to inspire your work? Out of the many fascinating microscopy photos Susan Beiner showed us, this is the one that invited me in. There was no real reason for choosing this specific image; it was just the prettiest to my eyes. The photo seems like a place I’d like to visit and explore.

What do you hope people will experience when they see your artwork? I hope people don’t feel like their was time wasted. I hope that viewing this piece can transport someone, somewhere even for a moment.

What part of this project was most rewarding or challenging? The most rewarding aspect to this piece was within the challenge. I fired this piece four times out of frustration, and still not being satisfied I broke the originally planned large sheets of clay into small chunks with a hammer. I glazed them into place and fired this piece one last time. A steep climb, but overall a rewarding, learning experience.

What do art and science have in common? In my opinion science and art are one and the same. They are different paths to the same goal. Always intertwining and seeding one another, they cannot exist alone. American philosopher Elbert Hubbard once said, “Art is the beautiful way of doing things and science is the effective way of doing things.” I tend to agree with Mr. Hubbard.

What can scientists learn from artists, and what can artists learn from scientists? Scientists and artists can learn plenty from each other. This is a major thought of my generation and it shows. From Apple to 3-D printing to the Discovery Channel, the line between art and science has been blurring more and more as the days go by. This trend shows no sign of stopping and I expect to see the day when the words “Artist” and “Scientist” become synonyms.
Jessica Palomo is a Texas native artist who was born in Dallas. She works in drawing and sculpture to investigate uncomfortable situations. Jessica received her Bachelor’s of Fine Arts in 2007 from Southern Methodist University in Dallas. She has assisted many artists, including sculptor John Collier for six years. Jessica was an artist-in-residence at the Palazzo Rinaldi Residency in 2011, had a solo exhibition in Neopoli, Italy, and has exhibited across the United States. Jessica Palomo is currently pursuing her Master’s in Fine Art at Arizona State University in Tempe, Arizona where she also teaches foundational art.

What subject did you use with microscopy to inspire your work?
I took inspiration from the microscopic image of cauliflower. I was interested in its bulbous curves, the microscopic detail of folds as well as the cauliflower plant itself.

What do you hope people will experience when they see your artwork?
I am interested in a viewer really investigating a piece and finding out what it is and why they like it. I want the work’s abstraction to play to the curiosity of the viewer, but with a nod to something familiar. That is why the microscopic images work so well — they offer some resemblance but also unfold a world of shapes we never knew were there. Seeing this unknown was the most exciting for me. I wish I had one. I would use it all the time. The forms are full of possibilities to explore.

What part of this project was most rewarding or challenging?
Personally for me the most difficult aspect of the collaboration was actually working with the clay. I am currently in the drawing program; my undergrad was in sculpture but not ceramics. Manipulating the clay to do what I wanted was an everyday struggle.

What do art and science have in common?
To me the most obvious similarity science and art have is exploration. As artists, we are constantly seeking and researching about our interests; collecting data and information that then fuel our ideas, our interpretations, our art.

What can scientists learn from artists, and what can artists learn from scientists?
I feel like I don’t know enough about “scientists” to know what they can learn from us. We could do all the things that I do with art but with science and vice versa. People learn from people period, that’s why collaboration is so beneficial. The microscope is obviously new technology for ASU science department, but we leaped with excitement at the chance to use it with our own collected items. The alternative is an endless Google search in hopes to find what we are interested in. Artists take inspiration from all the fields, so some common tool to them is a whole new world to us.
Chris Phillips is a twenty-eight year old male, from the dry desert of Yuma, Arizona pursuing his passion for the process. Ceramics has been a passion of his since the early development days of community college back in his hometown. Knowing that there was so much more to learn, he decided to make a life leap into ceramics at ASU.

What subject did you use with microscopy to inspire your work?
I used mold grown on a piece of wet clay infused canvas simply because it is a part of the ceramic process and it was on myself in the studio.

What do you hope people will experience when they see your artwork?
Exuberance of repetition gradually giving way to a sense of order.

What part of this project was most fun or rewarding?
Having this piece in the show, plain and simple, is the most rewarding to me.

What was most challenging?
Time management with this work wasn’t so much difficult, as it was tedious, pouring porcelain molds over and over. Plus, the soda fire technique using the flux as the only connective material for the stacked structure.

What do art and science have in common?
Chemistry.

What can scientists learn from artists, and what can artists learn from scientists?
Scientists could benefit from artists by finding creative solutions rather than what seems practical or logical. While the artist could learn more about the structure of elements to create new works of art. Like a clay body that is mostly metals rather than feldspar and kaolin.

Spherical spores with ornate surface details produced from a mold growing on decaying fabric. Small thread-like fungal cells (hyphae) and large fabric fibers can be observed.

Micrograph was taken at a magnification of 1000x. Scale bar = 20 micrometers (0.02 millimeter).
Gayle Timmerman

Gayle is an artist and anthropology major who has lived in the Phoenix area since 1987. Her sculptural ceramic work has centered on natural history, and cultures of the North American Southwest and Mexico. At present, she is advancing her ceramic knowledge and skills at ASU’s ceramic department. Her study of Anthropology is a natural outgrowth of curiosity and appreciation of the natural world, and of a desire to understand human evolution and behavior. Gayle understands human behavior is largely determined by culture and education, which drives the kind of stewardship humans express around the world they live in. As the world is entering the sixth great extinction, she feels incumbent to express the urgent need for change. Gayle’s sculptural work expresses in measure, a glimpse of the inexplicable beauty of the natural world and illustrates our connection to nature.

What subject did you use with microscopy to inspire your work?
The sculptures titled, *Within the Flower*, reflect the structure of life within Salvia greggii flower. This flower appealed to me, as it thrives in urban Phoenix gardens, attracts hummingbirds, and is water-wise for this climate. In the microscopy, the luring brain-like fungus hangs over a combination of trichomes that move spheroid pollen, which I found strangely beautiful. I was struck by how similar this microcosm is to the larger plant life we see in our gardens, that we walk over mostly unnoticed.

What do you hope people will experience when they see your artwork?
To delight, and encourage curiosity of our world.

What part of this project was most rewarding or challenging?
Creating the forms, while discovering and appreciating the micro life growing, cycling through its seasons was most delightful aspect of this work. The most challenging aspect of the project was the ceramic process.

What do art and science have in common? What can scientists learn from artists, and what can artists learn from scientists?
Art and science are a process of discovery. New ideas and theories are explored through research and the trial and error process. Both disciplines require rigorous attention to detail and at the end, are presented for review with contemporaries and public opinion. These are common themes and from this we can communicate ideas to the public, science providing the truth of the nature of life, and art expressing that to inform and draw in public appreciation.
Danyel Walker

Growth Spurt, porcelain, 18 x 20 x 13 in., 2015

Description of featured piece:
The piece is a molecular looking sculpture coated with a glaze that grew macro/microcrystalline structures on the surface of the piece. Porcelain, hand-built, slip-cast

Bachelor’s of Fine Arts (Ceramics)
Expected year of completion: Spring 2016

Description of featured piece:
The piece is a molecular looking sculpture coated with a glaze that grew macro/microcrystalline structures on the surface of the piece. Porcelain, hand-built, slip-cast

A series of small furrows along the surface of glass show minute angular and linear details.

Micrograph was taken at a magnification of 1500x.
Scale bar = 10 micrometers (0.01 millimeter).

Danyel has been working with clay for the past eight years, and her desire for knowledge has only grown. Over the past two years, she has been fascinated with the science within ceramics, specifically making crystalline glazes. Through extensive research, many late nights, and kiln loads of glaze tests, she has been able to create several glazes that produce brilliant crystals. Though she knows she has only touched the surface of her career and experiments with clay, the results — whether good or bad — have kept her fire lit for the future.

What subject did you use with microscopy to inspire your work?
I have been studying crystalline glazes for a couple years, so I sent in a shard of a tile that had a crystal glaze on it. The images that came back blew my mind, though I didn’t sculpt a piece that looked anything like them. I wanted to show “Well this is what it looks like to your eye, and if you look at this image, that’s what they are really doing,” so I made the piece and just covered it completely with crystals.

What do you hope people will experience when they see your artwork?
I want people to get close to the piece. The piece is meant to take the viewer to a microscopic level, where they are able to look at a molecule-like shape covered in crystalline structures, so being as close as possible is the key to really experiencing the piece.

What part of this project was most rewarding or challenging?
The most challenging part was just making the piece. Because some of the parts were hand built, and some were cast, the piece had a rather unique balance to it that caused it to tip rather easily. I had to readjust the parts a few times, as well as remove a few things from it as it was drying and things started to crack. The most rewarding moment was, after all the craziness of cracking, readjusting things, testing glazes, it came out of its final firing covered in crystals. There was no failure with that part and I could finally just breathe.

What do art and science have in common?
They have so much in common, especially in ceramics. There’s things like how knowing the periodic table is useful in ceramics because we are constantly using things like iron, sodium, and potassium, so knowing where they stand helps. We are also constantly testing and experimenting, which is something science and art have in common. We need to experiment to know if there might be new results.
Shiyuan Xu was born in Hangzhou, P.R. China and currently lives in Tempe, Arizona. She received her Bachelor’s of Art in Ceramics from the China Academy of Art in 2012, and she is currently pursuing her Master’s of Fine Arts in Ceramics at Arizona State University. Influenced by Chinese culture while drawn to Western art, Shiyuan began her graduate study in a land in the countryside that grows a kind of green tea.

What subject did you use with microscopy to inspire your work?

I was born in Hangzhou, China, which is famous for cultivating the Longjing green tea. My aunt has land in the countryside and grows this kind of green tea. In my memory, I would spend a few weeks at my aunt’s house every year when I was a kid, playing with other kids in the tea land. I drink tea, and brought the green tea from home when I came to the States. From my perspective, tea is the everyday product, one of the symbolic items of China, as well as my memory of home. So I would like to see how the green tea leaf looks like when it is magnified. Surprisingly, the image of the tea leaf has the most complete form and interesting feature among others. Therefore, I chose it for creating my sculpture.

What do you hope people will experience when they see your artwork?

I want to deliver a whole new experience for an audience to view a familiar object from a different perspective. To present the neglected tiny things as they become visible.

What part of this project was most rewarding or challenging?

I had a tour in the microscopic lab and participated in the whole process of observing and scanning, which was a fantastic experience for me.

What do art and science have in common?

I think the process of achieving a final result has similarity. We all need to overcome the failures and difficulties.

What can scientists learn from artists, and what can artists learn from scientists?

Perhaps, the scientists can be more aware of some interesting details of the object they examine. While, the artists can gain the knowledge and have more sources to help develop works.