

INTO THE FUTURE WITH 3D PRINTING

BY GIGI ROSENBERG



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1 *Reclining Figure of a Woman (five years of sleep)*, 2013, by Sophie Kahn. Life-size, 3D printed nylon.
Copyright © 2013 Sophie Kahn. Used by permission of the artist.



Artist MG (galleryMG.com) always envisions her paintings in three-dimensions before she picks up a paintbrush. In her mind's eye, she “walks” around her imagined paintings “altering them and ultimately choosing one perspective to paint,” said the 20-year painter and 3D designer.

It's no surprise then that when she looked for a way to recreate one of her two-dimensional images as a piece of jewelry, she found 3D printing, and her art has never been the same.

The 3D printer offered her a way to take a painting and transform it into a three-dimensional object. But it also offered her something else.

“I love that every painting I make is one of a kind,” she said. But she also wanted the financial and emotional reward of making multiples of an object without a great upfront cost. 3D printing offers her a way to make many different forms from one original artwork and sell them in limited editions. Then, each piece can be priced so it's “financially accessible to the average person,” she said, which helps her expand her audience.

3D printing came to artist Ashley Zelinskie (ashleyzelinskie.com) in an aha moment right before she graduated the Rhode Island School of Design with a Bachelor of Fine Arts degree in glass. As she prepared for her portfolio review, she looked back on the work she'd made over four years and realized that everything “plugged in, lit up or was interactive in some way,” she



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said. Although glass blowing is an ancient technique, she realized she'd really been doing technology-based art all along. When she began searching for a medium to express her passion for technology, she discovered 3D printing.

"3D printing is as new as glass blowing is ancient and comes with conceptual freedom instead of artistic expectations," she said. This freedom made it even more enticing. But she had one big problem to solve.

"3D printing was so new it almost didn't exist," she said, so she decided to build her own 3D printer out of necessity. She did a crowdfunding campaign with Kickstarter in 2011 and raised \$3,000 to fund the purchasing of parts. "Over a few days, plywood, circuit boards and sweat turned into my newest creative tool," she said.

Like Zelinskie, artist Sophie Kahn (sophiekahn.net) combines this cutting-edge technology with an ancient technique: bronze casting.

Kahn trained as a photographer and then used 3D printing to transform herself into a sculptor. She discovered 3D printing when her interest in architectural photography led to 3D modeling.

"3D modeling simulated photography," she said. "It opened up the possibility of the imaginary or fantastical. You could make light do things that it couldn't in the real world, and take virtual photographs of a virtual building from perspectives that the human body couldn't occupy."



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In a class she took in 3D modeling, she worked with an architect who was reconstructing the Sagrada Família church in Barcelona. They used 3D scanning and 3D printing to analyze Gaudi's original maquettes to help them in the reconstruction project.

Kahn borrowed the 3D scanner and fell in love, especially with the errors it generated. "Scanning reveals all the blind spots in vision that photography conceals: the things we don't see, the spaces occluded from our line of sight are materialized as voids in a sculpture made from a scan."

The 3D laser scanning Kahn employs was never intended to capture a moving human body. "When confronted with a moving body, it receives conflicting spatial coordinates,

2 Ashley Zelinskie 3 *Golden Ratio I*, 2013, by Ashley Zelinskie. 3D printed gold plated steel. 6.5" x 4" x 1". 4 *Octahedron*, 2013, by Ashley Zelinskie. 3D printed nylon. 7" x 7" x 10". Copyright © 2013 Ashley Zelinskie. Used by permission of the artist.

“ I recreate sculptures and videos that resemble deconstructed monuments or memorials. ... They engage questions of time, history, vision, identity and the body. ~ Sophie Kahn

generating fragmented results: a 3D ‘motion blur.’” With the scans she captures, she creates 3D molds for metal or clay sculptures that bear the marks of the digital processes that they have undergone in the creation process.

Kahn appreciates that her work showcases the interaction of new and old media and the digital with the analog. 3D scanning and printing enable her to capture an aesthetic she couldn’t capture any other way. “I recreate sculptures and videos that resemble deconstructed monuments or memorials,” she writes in her artist statement. “They engage questions of time, history, vision, identity and the body.”

“They also speak to the impossibility of ever capturing more than a trace of the past,” she writes.

To create her work, Kahn first makes a 3D scan of a person or an object. She may work on this scan for several weeks, editing it, sculpting it and preparing it for 3D printing. “When I’m happy with it both formally and from an engineering perspective so that it will make sense to the 3D printer and I know it won’t break or fall over when printed,” she sends it to a printing service, in her case, a company called Shapeways (shapeways.com).

When she casts works, she makes a silicone mold from the 3D print and then pours in wax, which she sends to a foundry, or she press-molds stoneware into an open silicone mold before firing it and glazing it.

How does 3D printing work?

To 3D print, you need skills in 3D modeling or you need to hire a designer. The modeling is done using software such as Maya, Rhinoceros or Blender, which are the tools descended from computer-aided design (CAD). Zelinskie likened this software to “Photoshop or Illustrator but for three dimensions.”

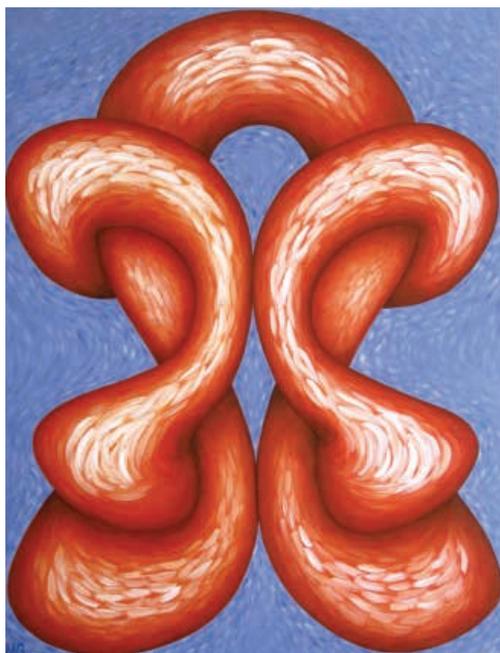
Once the object is “modeled,” you have to make sure it fits the specifications for the material and the printer you’re using.



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For example, when MG designed her jewelry, she had to try several options to ensure that the piece would be wearable. “The printing parameters can be quite specific as far as how thin any area of the model can be, how much distance has to be between areas that are not intended to connect and overall structural integrity,” said MG, whose jewelry line includes rings, pendants, bracelets and earrings sold at sloris.com.

Once the modeling is complete, you can either send your model to be printed by an industrial service such as Shapeways or do it with a desktop 3D printer, like a Makerbot, which can be purchased at Home Depot or at makerbot.com. These home printers, with a starting price of \$1,375, are about the size of a microwave oven and use a plastic derived from corn. The company’s chief executive, Bre Pettis, says the 3D printer smells like waffles when it’s printing.

MG uses the company Shapeways to create her prints. She uploads the scans of her jewelry and then waits for the prototypes to arrive, created by the 3D printer in plastic. Plastic is the most commonly used material for 3D printing because it’s inexpensive and durable, explained MG.

“Laser beams sinter shapes in the powder, building up very, very thin layers one at a time,” MG said. “This is why they call it ‘printing’ because the final 3D product is made up of countless ‘2D’ slices. The model is removed from the box of loose powder and dusted off. If it’s to be a colored product, it’s then dyed and let to dry for 1-2 days.”

What does 3D printing offer an artist?

3D printing gave MG a freedom she didn’t have as a painter. In painting, “one false move can change everything,” she said. “Digitally, I can play freely, changing anything and everything at any stage of development without fear of destroying a completed section of the piece.”

After she produces the one model she can then transform her idea into many different materials including colored plastic and different finishes in steel, bronze, silver, gold platinum, full color sandstone and ceramics. “Each material has different tolerances, so not every model can be made in every material, but as long as you keep your desired outcome in mind, it’s amazingly versatile,” she said.

Zelinskie was drawn to this technology because “I want to create art that is, in a meaningful sense, from machines and for machines,” she said. “3D printing allows me to take a file that would otherwise remain thousands of lines of code and turn it into a tangible sculpture. In this way, my art can be appreciated both inside and outside the box we call a computer.”



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7 *Infinity 16*, 2012, by MG. Oil on canvas, 36" x 28". 8 *One Infinity Ring*, 2013, by MG. Polished brass, 0.88" x 1.04" x 1.05". Copyright © 2013 MG. Used by permission of the artist.



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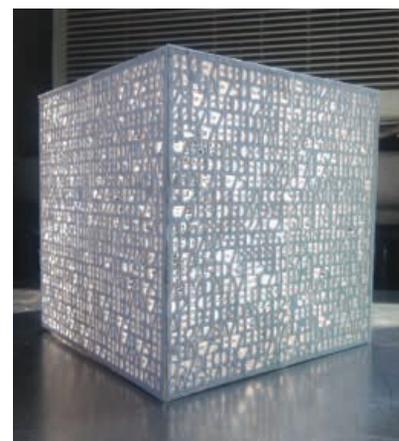
Zelinskie is also after something more futuristic. She entertains the possibility that one day the earth will no longer be inhabited by humans but by machines, and she wants to create art that machines can experience as well as humans.

The hexahedron in her Reverse Abstraction series is a good example. This series began with the premise “that humans and computers perceive the world through different languages, and what is concrete for one is abstract to the other. The objects and shapes so familiar in human art can be neither perceived nor conceived by computers in their original form,” Zelinskie wrote in the statement for this series.

“Likewise, the codes that are so familiar to a computer are merely scattered symbols to human sensibility,” Zelinskie writes. “The Reverse Abstraction series attempts to bridge the gap by constructing a traditional object in dual forms: as the classical object and as the hexadecimal and binary codes that represent them. Thus, abstraction

becomes material, the meanings for human and computers are united, and the duality is resolved.”

She first modeled the shape, a six-sided perfect cube. Then on the surfaces of the cube, she added the code for the shape.



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Before she prints the object, she determines size, color and material, which depend on where the sculpture will be exhibited and what qualities she’s aiming for. Because she wants to create art that can be “read” by both humans and computers, her creations require one extra step. When the modeling is done, she takes the file for the object and creates the code from it.

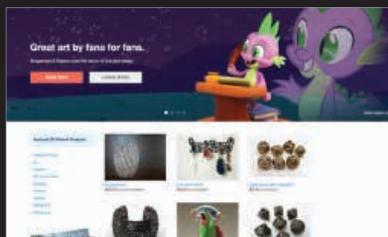
“Creating may be the wrong word,” she said, “because the code was there all along. The code is how the computer

9 *Période de clownisme, F*, 2014, by Sophie Kahn. 3D printed nylon on aluminum base, 9” x 12” x 11” without base. Copyright © 2014 Sophie Kahn. Used by permission of the artist. 10 *Cube [White]*, 2012, by Ashley Zelinskie. 3D printed PLA, 7” x 7” x 7”. Copyright © 2012 Ashley Zelinskie. Used by permission of the artist.

>> TO LEARN MORE ABOUT 3D PRINTING



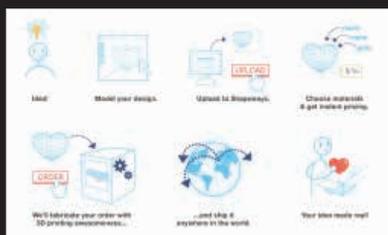
■ Watch *Will 3D Printing Change the World?* by PBS Digital Studios: bit.ly/pbs3d



■ Watch the tutorials and read the blog at shapeways.com



■ Check out learn3dprinting.co



■ Watch *Introduction to 3D Printing from Concept to Product*: bit.ly/skillshare3d



■ Look for many tutorials on 3D printing at Lynda.com



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sees the file on the most basic level. I am merely peeling away the layers of abstraction the computer puts in between how it thinks and how we see.” The code is then placed back on the object to complete its final form.

Kahn praised 3D printing because it makes the art-making process more affordable for artists. “Not everyone has a budget to run their own kilns or is affiliated with a university that has all the equipment,” she said.

3D printing also let her say something with her art she couldn’t say any other way. “I’m interested in the unintended emotional resonance generated by technology.”

How to get started with 3D printing?

“New technologies need more artists using them,” Zelinskie said. “These are the tools of the future and need to be in the hands of creative thinkers. The sooner we put them in the hands of artists, the brighter the future we can look forward to.”

To explore this future and experiment with bringing a third dimension to your art, start with the resources in the sidebar to the left. To see a 3D printer in action, see if your community has one. In my hometown of Portland, Oregon, I found a 3D printer at the Oregon Museum of Science and Industry. A 3D printer was also featured in one of the latest episodes of *Portlandia*, where residents hoped the 3D printer could save the city from fiscal crisis. Not yet. **PA**

Gigi Rosenberg is the editor of Professional Artist. She’s also an artist coach and the author of The Artist’s Guide to Grant Writing (Watson-Guptill, 2010). She’s been a guest commentator on Oregon Public Broadcasting, performed at Seattle’s On The Boards, and been published by Seal Press, Poets & Writers, and Parenting. For the latest, visit gigirosenberg.com or reach her at grosenberg@professionalartistmag.com.