





# Innovation in 3D

By Craig Crawford

DOI: 10.14504/ar.16.3..2

**T**here's nothing like a 3D "mini me" to make you realize, "Yes, those jeans do make my butt look big!"

I had hoped that the result would be a bit more Hollywood when I'd stepped into what felt like the E! Red Carpet GlamCam360—iMakr's 3D pop up body scanner. iMakr, a value-added retailer of 3D printers and 3D scanners, offers lab and consulting expertise across a variety of 3D printers, 3D scanners, and 3D printing media. The company offered the ability to scan me and then 3D print a "mini me"—the ultimate selfie.

Despite iMakr's online advice against wearing reflective surfaces and tiny prints, I had insisted on wearing my sunglasses and holding a tribal print bag because I was testing this out for the brand. Would the final result be color correct? Would the patterns be accurate? How detailed would the shoes be?

I was surprised at the detail: tiny stitches on my sweater, the stripes on my trainers, even the print on my bag was accurate, and the glare of my sunglasses captured. The only problem really—I looked frosted. Like I'd be dipped in sugar. So color, not pattern, is an issue.

## Not-so-Cheap Sunglasses

Not in the market for a mini me? Consumers also have the option to buy pq's 3D printed sunglasses, a partnership between renown industrial designer Ron Arad and Israeli eyewear manufacturer Assaf Raviv. An engineering feat, they are all one piece, with flexible temples that allow a natural joint-like movement with no hinges or pins. Worn by Pharrell Williams, Sharon Stone, and Oprah Winfrey, the US\$800 sunglasses have until recently only been available in Europe.

## 3D Fashion Apparel

Sure, in accessories, 3D printers are terrific for prototypes of products like eyewear or candles or buttons because proportion and detail can be precisely determined before handing off a more accurate spec to the supplier for a better product. But for apparel? Why bother? Just make the sample instead.

"It's not about newness in the 3D technology," explains Lynne Murray, director of the Digital Anthropology Lab at the London College of Fashion. Launched in the autumn of 2015, the lab aims to bring industry and academia together to explore seed ideas for fashion tech. "What makes 3D exciting now is that we are exploring combining 3D printing and 3D scanning with other technologies such as digital fabric printing to produce innovation."

She demonstrates two examples, 3D printed studs and 3D printed fish scales—both directly printed onto fabric. These effects were created using the Fabricate app for the Cube 3 desktop printer. Launched by 3D Systems, the app and printer are priced for home use, but suitable for industry prototyping. (The printer retails just under US\$1200, and textile packages—designs, cloth, and filament—retail for less than US\$150.)

So 3D printing is not the entire process, it's just part of it.



iMarker's 3D mini me scan of Craig Crawford.



Studs printed on fabric.



Fishscales printed on fabric.

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3D printing on nylon.

## Social Collaboration is King

MyMiniFactory.com is a curated social platform for 3D printable objects—think of Vimeo or SoundCloud but for 3D printing. The platform connects designers (who can upload, share, promote, and sell), makers (who can print for others), and users (who can download printable objects or buy printed objects). Brands also use the platform to create contests. Through social media features—post, like, follow, chat—the community fosters collaboration and design thinking.

WeDesign.live is an open sourced live collaborative design tool developed by **MyMiniFactory.com**. The aim is to empower designers in real time, explained **MyMiniFactory.com** CEO Romain Kidd.

“2013 was probably the peak of the 3D hype,” says Kidd, “and while the technology is still moving toward consumer usage, it’s the collaboration with other tech that’s making true disruption now.”

“There is a whole raft of design thinking that needs to happen that will allow designers to make things that won’t have to have additional treatment or post printing work,” Murray explains. A former jewelry designer who used 3D to create many of her pieces, Murray is very familiar with post printing processing.

The post-processing to create mini me was intense: the entire body scan was manipulated by iMakr’s team of artists/engineers. The file was color corrected and optimized for printing. And, like a pod person from *Invasion of the Body Snatchers*, mini me was assembled along with a crowd of mini others to maximize use of the 3D printing media (the printer

alone retails at US\$75,000). The mini folk emerged like a hoard of tourists in Times Square or Piccadilly Circus. They were then individually pruned and dipped into super glue—yes super glue—to make the colors pop.

## Back to Garments

Electroloom launched what is hailed as the first 3D fabric printer that prints an entire seamless garment. The process requires a 3D mold or object onto which the garment will print when placed inside the 3D garment printer. Through electromagnetic charges and media that reacts to the charges, the printer creates the full garment onto the form. Admittedly it’s early days, and the finished garment resembles Tyvek (which, by the way, was good enough for Fiorucci in the 1970s); however, other materials are on the development roadmap.

For Murray, this is exciting design thinking. “We are no longer basing skirt or shirt designs on yarn,” she says. “Instead, the electrically charged particles allow us to base it on shape.”

## Geometry and Texture

3D is about geometry and texture, explains a European-based 3D artist, whose employer allowed participation in this article as long as the fashion brand and hardware/software used remained anonymous. And for good reason—the design thinking used to set up the innovation lab within this brand is bleeding edge competitive advantage stuff.

A few years in the making, the lab uses a variety of 3D software applications, 3D scanning applications



3D printed textured lace pattern.

(hardware and software), pattern making software (CAD/CAM), off the shelf applications, as well as fabric scanning boxes, and color calibration tools. The results:

- Reduced prototyping and sample development (virtualized trials are used to approve design modifications on carry-forward styles or new styles based on previous “blocks”)
- B2B selling without samples because the virtual samples are *that* good (new styles as well as new fabric/colorways on key items)

This frees up design, product development, and the sample room to work on innovation rather than modification.

The brand has defined three different ways to produce virtual products: simulation, scanning, and sculpting.

## Simulation

Using CAD/CAM patterns, a garment is virtually stitched and fabric applied. There’s nothing new here; however, the fabric capture process is—when it’s applied to the simulated garment, the magic happens.

Fabrics are meticulously captured (at least 10 different ways using multiple light variations) and put into repeat. There are three things that matter with fabric capture: color, structure, and shine. Algorithms create these pixel by pixel. Each element is given its own layer onto the virtualized garment. The final rendered result is nearly impossible to distinguish from a photograph of a real garment in a catalogue line up!

Over time, the brand has cleverly built an extensive library of pattern blocks as well as fabrics for re-use.

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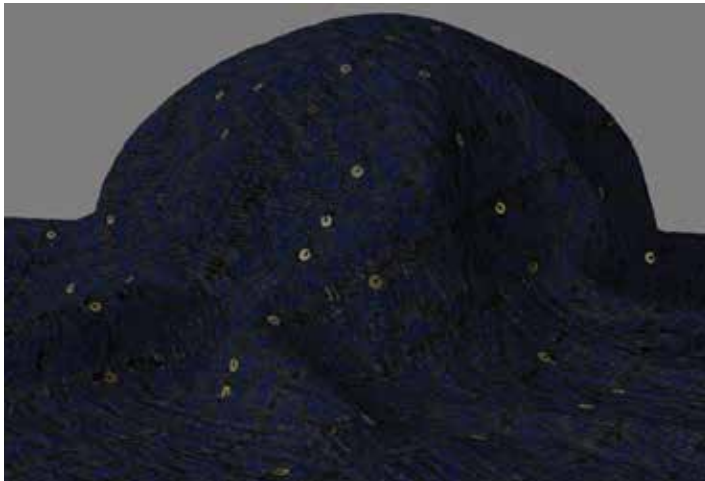
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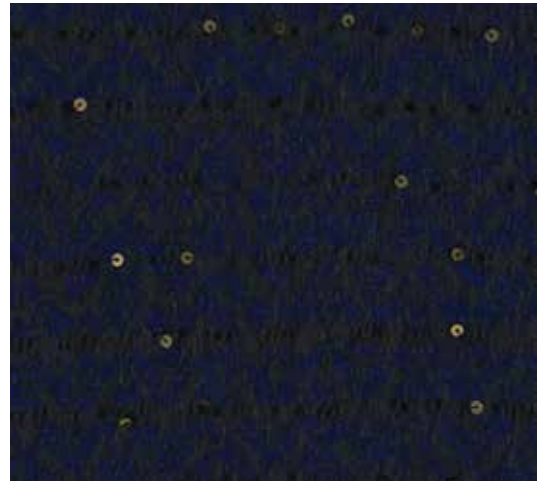
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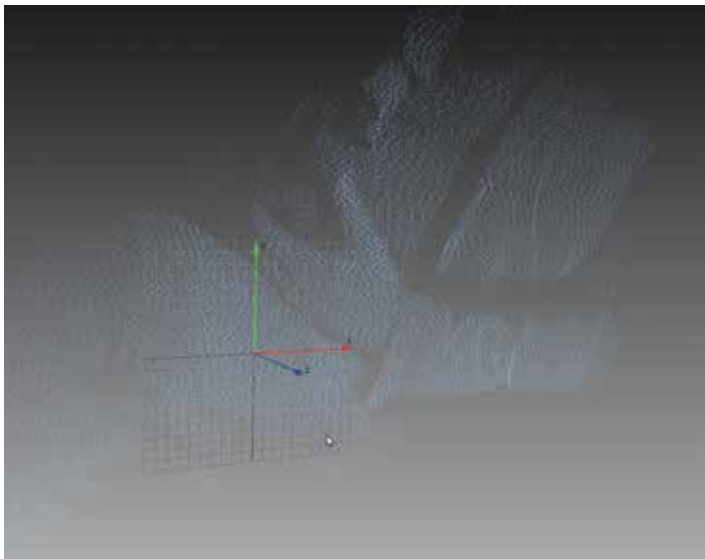
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Fabric drape scan.



Fabric texture scan.



Fabric rendered onto scan.

This makes this lab an ideation hub—saving time and money from concept to sales samples.

Simulation takes time, which is dependent on many variables. Quality of rendering is one factor; the viewpoint is another. A front-only view is much quicker than a full 360 view. A new fabric on an existing form could take minutes, while a modification to an existing form could take hours. A complex new form—for example, a suit that has as many as 80 parts—could take two weeks.

Whoa! That's a lot of computer processing power! “No problem, we just use external server farms for that,” I was told.

Simulation doesn't work for all garment types. The puffiness of a down jacket, for example, is very hard to capture in a virtual stitch up.

## Scanning

3D scanning is used when simulation won't work. It requires a “hero,” or sample product, to be scanned. Improvements in hand-held scanners mean that my days in the 360GlamCam are over. A brand doesn't need to give up fixed real estate to perform a 360 scan. Or spend a fortune. Costs can be under US\$20,000.

According to Roshan Paul of the Hohenstein Institute, low-cost hand-held portable 3D scanners have accelerated industrial adoption of the technology. A skilled operator can get a 360 detailed view of an entire puffer jacket from a hand-held scanner in a couple of hours.



Watch a video of 3D printed fabric move (Kinematic Petals Dress):  
[www.vimeo.com/156244098](http://www.vimeo.com/156244098)

How the kinematic petals dress was made:  
[www.n-e-r-v-o-u-s.com/blog/?p=7162](http://www.n-e-r-v-o-u-s.com/blog/?p=7162)

As a demonstration, part of me was scanned during the interview. Then, my scarf was captured using the same meticulous fabric capture method referenced earlier.

The fabric was then rendered onto my scan. Voila! My trousers went from flat knit to sparkle knit in less time than it would have taken to create a sequined knitted garment.

### Sculpting

“When you have nothing, you sculpt like a sculptor,” my guide explains. “But virtually, in 3D.” Using off the shelf AutoCad and other 3D engineering tools, a product is created from scratch.

This method is most satisfactory when creating trim items, such as a button, snap, or zipper pull. And then these sculpted items can be applied to any other virtualized product. Even full Visual Merchandising programs can be built if needed.

Each artist uses up to three screens to work—one of which is a large TV, used to zoom into fabric construction details.

Knowing what tool to use for what type of product takes skill. Make no mistake about it; these folks are highly skilled artists and engineers. They are in-house design thinkers.

Simple modifications to a product that has been previously photographed are rendered on Photoshop; there’s no reason to drive a tack with a sledgehammer. Often, a variety or combination of applications and methods are used to create one virtual product.

It is the joining up of the technology that is making the magic happen.

### The Next Step in Innovation

“It’s this funnel of convergence that’s exciting—pushing the boundaries or blurring them to join up the tech to create new things,” Murray says. She cites

MIT’s 4D printing research project that introduces secondary properties to 3D printed materials so that the finished item reacts to light, heat, or water.

The online videos are fascinating to watch—strings that change shape, flat squares that form a cube as they close. Printing is no longer a finite thing. However, until my zipper knows that I’ve left the men’s room with it open and closes itself automatically, is this really relevant to fashion?

“Industry and researchers should have more focus on industrial innovation,” Paul says. “3D body scanning is a promising tool for designing special and customized garments for the elderly and disabled,” he cites as an example.

“As early patents on some of this technology come to an end, we will see more innovation,” Kidd says. “All of this means we will have new ways to form new collaborations.”



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