

# Popular Mechanics

<http://www.popularmechanics.com/technology/gadgets/news/3d-body-scanning-technology-applications>

## 5 Ways Body Scanners Could Make Fitting Rooms Obsolete

BY AMANDA DEMATTO

**Far too many hours of our lives are squandered** trying on clothes. But as more apparel companies catch on to 3D body scanning technology, the fitting room could become a thing of the past. Within seconds, 3D body scanners take a snapshot of the human form and produce a 3D replica, with complete measurement data. From injury-preventing sneakers to lightweight firefighting gear, here are five ways 3D scanning tech is being used for a better, more intimate fit.

### Cornell University Fits Firefighters



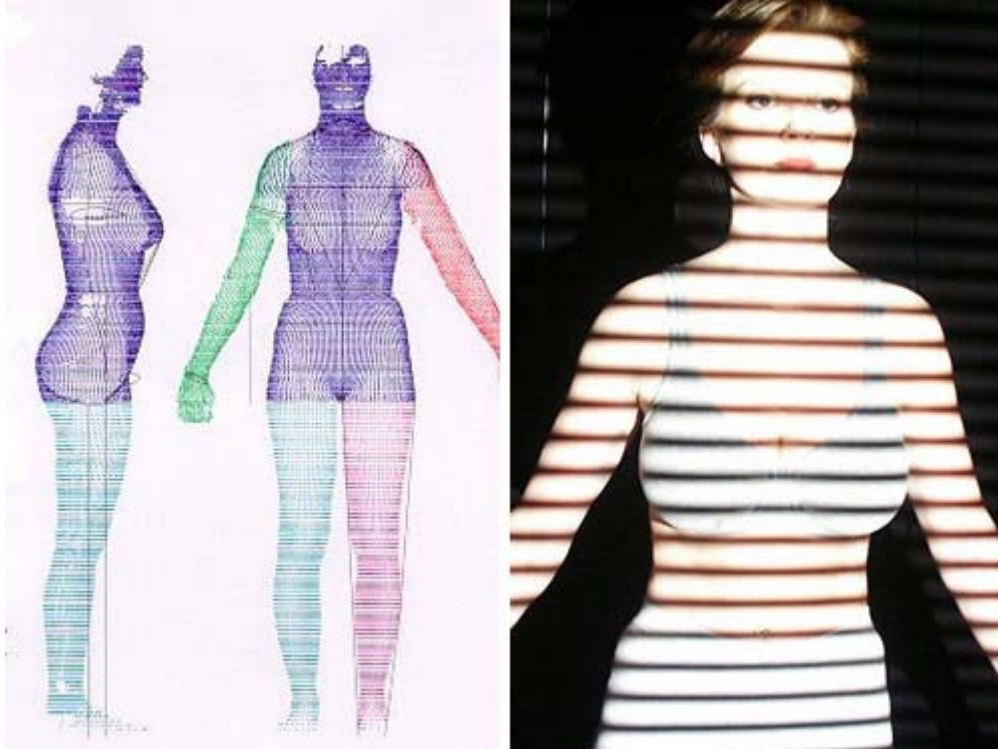
Standard clothing looks and feels fine when we're standing up straight with arms to the side like a mannequin, but the moment arms bend akimbo or reach overhead, fitting imperfections abound. The distress is far worse for our men in uniform—firefighters slipping into clunky armor and boots with haste, knowing that their lives depend on this gear but are simultaneously threatened by its unwieldiness.

Susan Ashdown of Cornell University's Bodyscan Research Group uses two robust 3D scanning technologies to study not only how clothing fits, but also how it functions, with a focus on improving firefighter gear. This particular image is a 3D scan of a firefighter in minimal clothing (gray) superimposed with a 3D scan of a firefighter in uniform (translucent orange) to reveal the relationship between the gear and the body in an active position.

The firefighter's body is captured as a dense cloud of over 300,000 points with either TC2, a device that projects white incandescent light, or Human Solutions, a laser scanner. Until the point cloud is fed into Polyworks software program, which blows three-dimensional life into the cluster, it resembles a swarm of gnats with a blurry human-like outline.

The technology's only defect, in Ashdown's opinion, is converting the digital "statue-like" scan into apparel that actually fits. She believes that once this technological piece is perfected, there will be a surge in the use of 3D imaging within the apparel industry.

### Follow That Changing Body Type



College students, notorious for donning oversized tees, baggy Dickies pants and pajama flannels, don't really know what it means to have clothing that fits, says Dr. Karla Simmons of Auburn University. But she's determined to show them.

She uses the TC2 3D body scanner to determine where the weight fluctuations that typically accompany college life deposit themselves. Now in the fourth year of her "Freshman 15" study, she has analyzed the body shapes of over 200 Auburn students from their freshman to junior years, and saw that in the first year they gained an average of 4 pounds.

But what's even more useful than viewing the bodies three-dimensionally, Simmons says, is that the software also allows you to take slices at any location. These cross-sections illustrate subtle variations in curvature and circumference, allowing Simmons to see exactly where weight is deposited, which is important because precise measurements alone don't necessarily guarantee fit. "We might have the same hip measurement, but you might carry more weight at the front part than I do, and I may carry more of it in the back," she says. "We have the same measurement but a totally different shape."

Simmons shares her data with apparel companies so that they may keep a running database of body type categories to better meet the needs of their customers. The main problem with the technology is getting from the 3D data to the final product, Simmons says. Custom pattern-making software is available, however, she says, "it's still not a seamless process."

### Sizing Up the Competition



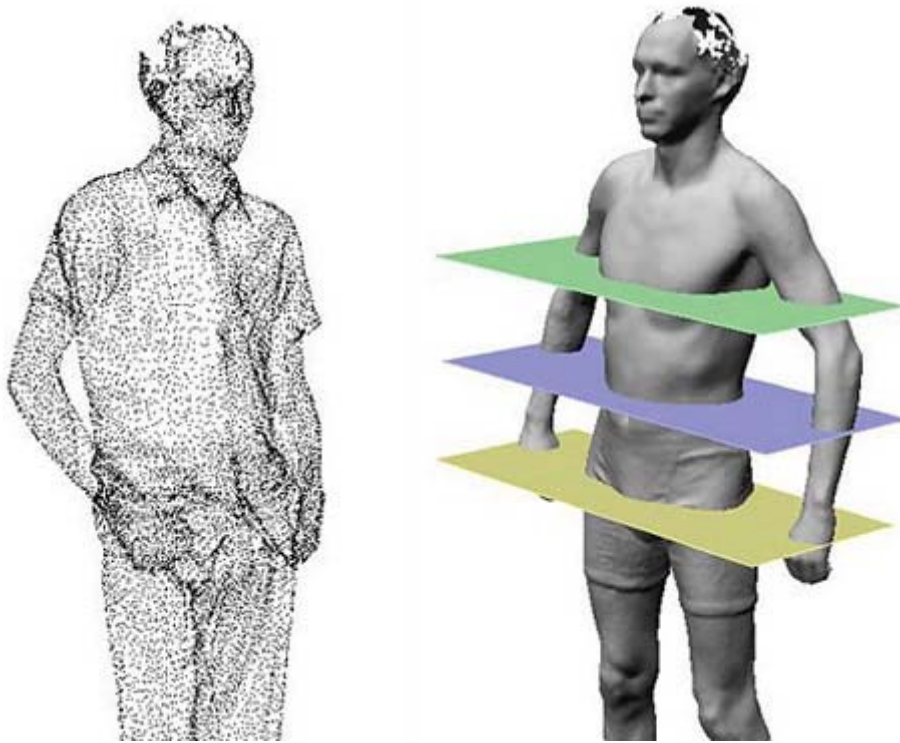
Like any running shoe company, Brooks Running Shoes has their eye on the competition, but they see them in up-close 3D. Brooks uses motion-capture technologies to survey the wear and tear of competitor shoe-makers, following real runners as they move in shoes Brooks is developing as well as new entrants to the shelves from the likes of Saucony, New Balance and Nike. "We're using this as a way to analyze how effective we are at reducing the risk of injury in our footwear," says Eric Rohr, Brooks' biomechanical engineer.

When designing a new shoe, Rohr and other researchers may test four or five unique prototypes to understand how each functions. For instance, Version 1 may have a different heel design than Version 2 and dramatically alter a runner's knee alignment.

In the lab, 8-mm reflective balls are placed on a runner's bony landmarks, such as the hips, knee joint, femur (thigh), tibia (lower leg), ankle and foot. Runners are then given instructions to jog down a walkway while eight retro-reflective cameras that emit infrared light pick up their motions in space over about 250 frames per second. After testing, the updated information is transmitted directly from the lab to the designers for subtle tweaking.

Brooks tests their shoes on large sample sizes of runners to guarantee fit and injury prevention for as many different individuals as possible. They measure variables like the hip's relation to the knee and foot flexibility, and place runners into categories that define running tendencies and address physiological needs.

### Oklahoma State Aims to Make the Uniform Fit

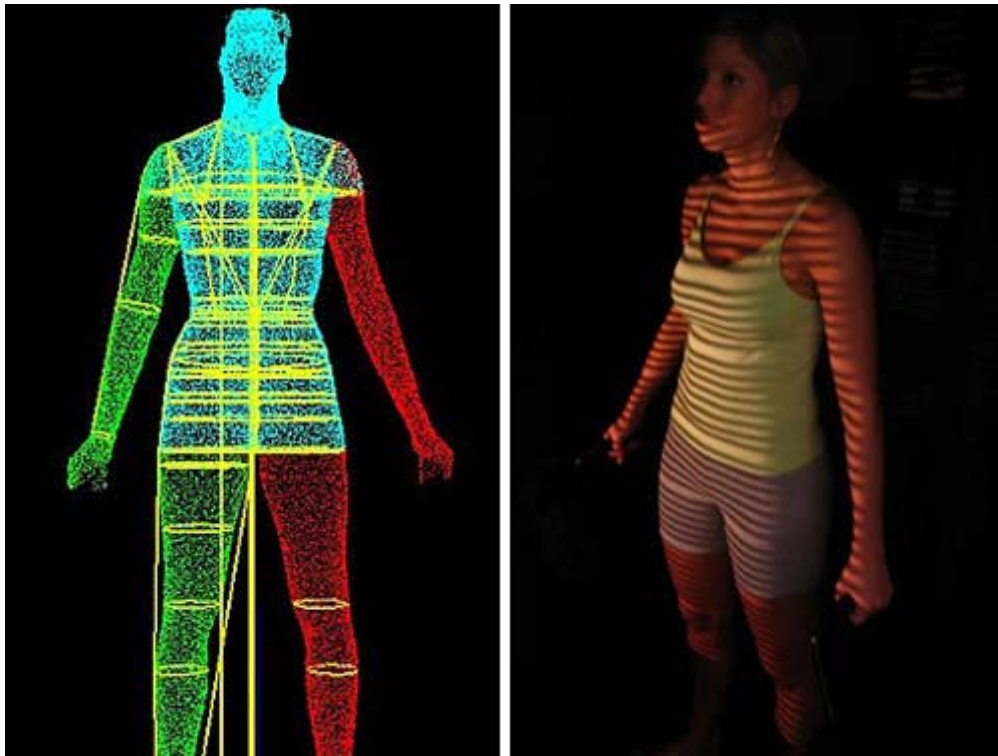


Oklahoma State University's Institute for Protective Apparel Research and Technology (IPART) uses 3D full-body scanners to improve protective clothing for HAZMAT (hazardous materials) workers, the military and agricultural laborers. The research can also be used to develop sizing systems for target populations so that well-fitting apparel can be supplied to more individuals out there.

At the center of IPART research is the Human Solutions VITUS XXL 3D full-body scanner, a square booth with a column housing one laser and two cameras tucked into each corner. As the lasers and cameras synchronously descend from the ceiling to the floor, the lasers light up the body surface while the cameras capture the reflected light. In about 10 seconds, the device captures precise measurement data, which is then rendered by a software program.

Adriana Petrova, an IPART researcher, says that two scans are usually taken to adequately evaluate fit, one with the person fully clothed and the other with minimal clothing. The two scans are then superimposed and compared. "The success of this manipulation depends on the alignment of the two scans," Petrova says.

### **Scanning for a Swim**



For many women, shopping for a bathing suit can be a harrowing experience. Pinched love handles, tummy rolls and thigh bulges are just a few of its hallmarks. Lori Coulter, founder of the St. Louis company of the same name, hopes to show women that the problem isn't their bodies, but the swimsuits.

"TrueMeasure" is Coulter's adaptation of TC2's cutting edge technology. Individualized patterns are created for each customer based on their scanned measurements, then digitally cut in the factory and sewn together by human seamstresses. For about \$200, you get the works: a scanning session; endless choices of luxurious Italian fabrics, bra lining and cup material; and finally, a custom, made-to-measure swimsuit. More affluent customers can upgrade to swimwear encrusted with Swarovski crystals and other decadent embellishments.

Coulter's process aims to accentuate the positive in a woman's figure while drawing attention away from parts that may be a point of insecurity. "Swimwear bust is a major concern for a lot of women," Coulter says. "We spend a lot of time engineering bras to provide optimal fit and performance."

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