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Beware 3-D Printing!

By ALEXANDER EULE

The new technology may hold great promise, but the stocks do not. Why the industry darling could tumble 80%.

It was meant to be the moment science fiction finally met reality. This past January, makers of 3-D printers reserved 7,000 square feet worth of space at the Consumer Electronics Show. At their introductory press briefing, CES organizers described how 3-D printing was driving a new industrial revolution. The Las Vegas show floor was littered with small boxes spitting out plastic figurines and minimalist jewelry. Not exactly the stuff of a new world order in manufacturing, perhaps, but the tech world nevertheless declared 2014 the year of the 3-D printer.

Wall Street has been well ahead of the hype. Shares of **3D Systems** (ticker: DDD), the industry's largest pure-play stock, are up 370% over the past two years. **Stratasys** (SSYS) is up 231%. And since their 2013 initial public offerings, **ExOne** (XONE) and **Voxeljet** (VJET), are up 140% and 166%, respectively. Each of the companies has a slightly different focus, with 3D Systems increasingly tied to consumers and Voxeljet strictly focused on large-scale industrial machines.



Enlarge Image

Scott Pollack for Barron's

In each case, though, investors are missing the point -- and overpaying in the process. Yes, 3-D printing holds vast potential; it could eventually reshape U.S. industry. But that's because of its applications in industrial manufacturing, which the publicly traded 3-D outfits don't address as effectively as some private companies. The systems of those private firms have been embraced by the likes of **General Electric** (GE). The industrial conglomerate is currently using 3-D printers to manufacture key parts for its next-generation jet engines.

Pure plays in 3-D printing, meanwhile, seem more interested in consumer novelties and the hobbyist market. Consider Rock Hill, S.C.-based 3D Systems, with a market value of \$7 billion. At CES, the company unveiled a dozen new printers, including a sub-\$1,000 version of its entry level Cube printer. A few days after the show, 3D issued a press release touting a partnership with **Hershey** (HSY) to create an in-home chocolate factory. The plan, 3D said, is "to explore and develop innovative opportunities for using 3-D printing technology in creating edible foods, including confectionery treats."

The day of the announcement, 3D Systems shares closed up 3%. The company has a ChefJet sugar and chocolate printer slated for delivery in the second half of the year.

But lately, 3D Systems has grown better at printing press releases than profits. The company has repeatedly missed its own earnings forecasts, while lowering the bar for the future. Early last month, shares fell 20% after management warned about fourth-quarter earnings, blaming higher spending on research and development.

The stock recovered, before falling to a recent \$69. Investors have made a habit of overlooking bad news from 3D Systems. A year ago, analysts thought the company would generate \$1.31 a share in earnings for 2014. Today, the forecast stands at 82 cents per share. The 37% haircut has been accompanied by a 110% gain in the stock, and Wall Street remains as bullish as ever. Fourteen analysts rate 3D Systems a Buy and four a Neutral. Just three rate the stock as Sell or Underperform.



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3D Systems is expected to earn \$85 million on revenue of \$702 million this year. It currently trades at 84 times earnings, a wild multiple for a company likely to see per-share profit decline by three cents this year.

The hot story for investors is 3D Systems' 37% sales growth. But even on that basis, the valuation looks stretched. At 13 times last year's revenue, 3D Systems is the third most expensive technology stock in the Standard & Poor's 1500, behind only Facebook, at 23 times, and Visa, at 15. Investors are pricing all of the 3-D pure plays at premium valuations; Stratasys, ExOne, and Voxeljet all carry

double-digit sales multiples.

Facebook and Visa have unique networks and some power to dictate pricing on its products. 3D Systems is driving down the price of its printers, trying to compete with a wave of upstarts.

FOR ALL THE ATTENTION ON 3D Systems, Stratasys boasts the world's largest installed base of 3-D printers, with roughly 65,000 systems. In 2010, Stratasys partnered with Hewlett-Packard to manufacture 3-D printers under the HP brand. By mid-2012, the companies had canceled the deal, offering little explanation. HP recently said it plans to enter the market, though details are scant.

In 2014, Wall Street sees Stratasys revenue growing 39%, to \$674 million, with profit of \$117 million, or \$2.21 a share, a 20% gain.

As for Germany-based Voxeljet, which has a market value of \$540 million, it sold a total of three printers in its most recent quarter, for \$2.5 million. This was actually better than a year earlier, when the company sold two used printers. For 2014, analysts expect Voxeljet to earn \$1.1 million, or seven cents a share, on revenue of \$18 million. The stock recently traded at \$35.

"Investors love organic revenue growth," says Whitney Tilson, manager of hedge fund Kase Capital and co-founder of the Value Investing Congress. "The problem is that you really have to differentiate between organic revenue growth and profitability."

Tilson calls 3D Systems a "dream short," and he has been adding to his own short position of late. He's betting against four other 3-D printing names, as well, which he declined to name. "These stocks are being valued as if this is the next coming of the iPhone and iPad combined," he says. He describes walking around CES seeing dozens of companies hawking essentially the same thing. "There was booth after booth of companies with very similar products to 3D Systems. And at lower prices."

He thinks 3D Systems would be generously valued at three times revenue, which would put the stock at \$15, 80% below its recent close.

WHILE CES ATTENDEES were gawking at the 3-D showcase in Las Vegas, game-changing developments were taking place 2,000 miles away in Cincinnati, the home of GE's aerospace unit.

GE Aviation is inverting age-old manufacturing techniques as it builds its next-generation jet engine. Rather than assembling finely honed metallic parts, GE is printing the engine's fuel nozzles layer by layer. While prior nozzles were made of 20 different parts, the 3-D printed version is a single piece, optimized to spray fuel into engines. The new nozzle is 25% lighter than current models, GE says, and will last five times longer before servicing. GE says its new Leap engine, which should see first deliveries in 2016, will reduce fuel consumption by 15%.

Such is the real promise of 3-D printing, which for decades has been known by less-sexy terms such as additive manufacturing or rapid prototyping. GE says it already has 6,000 engine orders, making Leap the most successful ramp-up in jet-engine history. With 19 nozzles in each engine, GE is embarking on an unprecedented 3-D printing run.



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Courtesy of GE; robots, 3D Systems

GE Aviation is using 3-D printers to make fuel nozzles for its next generation jet engine, above and right. Below, robots printed by 3D Systems.

GE got a jump-start on 3-D printing in 2012 when it acquired privately held Morris Technologies, long a leader in rapid prototyping. Morris has historically counted on printers from a family-owned German company, EOS, which has nearly half the market for metal-capable printers, says William Blair analyst Brian Drab.

Today, GE Aviation owns 34 industrial 3-D printers, ranging in cost from \$500,000 to \$800,000. Only one comes from 3D Systems.

The fuel nozzle could be just the start of the additive revolution. "There is no part of the jet engine where we are not considering leveraging additive manufacturing," says Steve Rengers, who heads R&D for GE Aviation's additive development center. "It's about designing without the constraints that we've held for centuries."

DESPITE THE RECENT BUZZ, 3-D printing is a relatively old industry. 3D Systems was the first to commercialize an early version of the technology, known as stereolithography, in 1988. The expiration of patents has since ushered in new entrants, driving down the cost of basic systems. As 3D Systems prepares to break the \$1,000 threshold, smaller rivals are already selling \$500 models. Entrepreneurs on Kickstarter are offering preorders for devices starting as low as \$199.

At any price, 3-D printing remains slow and cumbersome. It can take a full day or longer for printouts to cool. Gravity requires that 3-D objects be printed with support structures attached to them, to prevent collapse. Eventually, that scaffolding has to be removed. 3-D printers "are not for the faint of heart," says Andy Lauta, a product manager for **Adobe Systems**, which recently added 3-D print capability to Photoshop, its flagship design software. Adobe (ADBE) is trying to solve the incompatibilities that often arise between a desktop computer and a 3-D printer, much as it did with laser printers three decades ago.

If 3-D printing transforms the world, software will play a crucial role. In that sense, names like Adobe and **Autodesk** (ADSK) are a safer and more diversified way to play 3-D printing. France-based **Dassault Systemes** (DASTY) is another software firm likely to play a role in any 3-D success.

The actual challenges of making a 3-D object often gets left out of the hype, says Terry Wohlers, the industry's highest-profile expert. His Wohlers Associates was founded in 1986 to track new design and manufacturing technologies.

As Wohlers sees it, people say, "Wow, I can do these really high-end metal parts on a \$500 machine. You push a button and out pops a shiny part.' But there's just a lot that goes into building a good quality part." He points out that home photo printers have essentially been a bust because of the time and commitment required to get a quality print. And 3-D printers, he says, are "an order of magnitude more messy than a photo printer."

Nevertheless, investors were thrilled last May when 3D Systems said it would begin selling its Cube printers at Staples. The stock jumped on the news, and within a month, 3D Systems shares had risen 25%. Nearly a year later, there's no word on the partnership's success. But Drab, who covers 3D Systems for William Blair, has offered sobering evidence. Last September, he called 112 Staples stores. Only four had a Cube on display, and he could confirm only two sales. Drab has an Underperform rating on 3D Systems.

3D Systems says it has sold 22,000 consumer printers since launching its consumer initiative in 2012. The company declined to talk with *Barron's*.

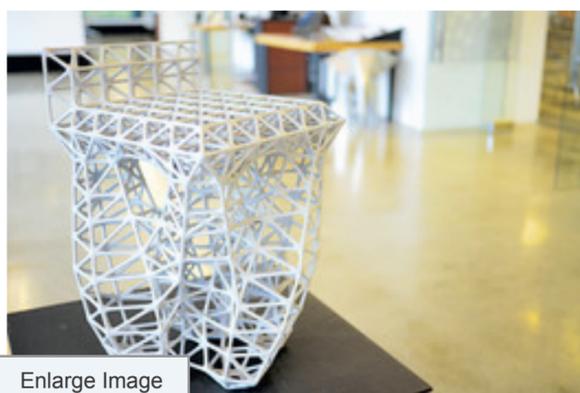
SHAPEWAYS IS A venture capital-backed firm building its business around the limits of at-home printing. The company prints consumer-uploaded designs for personal or commercial use. Shapeways isn't messing with low-cost printers; it uses machines that range from \$60,000 to over \$1 million. Some come from 3D Systems, Stratasys, and ExOne, but, like GE, Shapeways relies on EOS for much of the heavy lifting. "They've just refined it a little bit more than some of the others on the market," says Shapeways executive Duann Scott. "We push these machines to the absolute limit." Shapeways is printing 120,000 objects a month, from smartphone cases to earrings to ceramic bowls.

Other companies are trying to capitalize on the 3-D opportunity. **Ford Motor** (F) says it's using 3-D printed prototypes to test parts of new cars. An engine prototype, printed from a sand-based material, costs \$3,000 to make and is available in four days, Ford says. A similar prototype used to require months to create at a cost of a half-million dollars.

But even Ford can't resist a little hype. On a corporate Website about 3-D printing, the company describes the future: "One day, millions of car parts could be printed as quickly as newspapers and as easily as pushing a button on the office copy machine." One day, maybe -- but not just yet.

Pull Up a Chair and Take a Look

What if we've always been wrong about how to make a chair? Technology is forcing the question.



[Enlarge Image](#)

Courtesy of The Living

From Autodesk, the chair of the future?

Autodesk, a pioneer in computer-aided design, or CAD, software, is increasingly bringing information about the real world -- think 3-D models of urban landscapes and homes -- into its software. The goal is for a designer to input a function, letting the computer dictate the most efficient design.

One such design is sitting on the desk of Jeff Kowalski, the chief technology officer at Autodesk. It's a model of a chair, printed in titanium on a 3-D printer. Legs have been replaced by something similar to roots or veins. "I asked the computer to build me a structure that is as light as possible but still holds the person sitting on it," Kowalski says. "This is what's so cool: We've got this superflexible fabrication technology that doesn't care about the form. We're now liberated to use the computer to find new forms that even better satisfy our goals and constraints in design."

-- A.E.

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