

3-D printers to make human body parts? It's happening

February 4 2015, by Steve Johnson, San Jose Mercury News

It sounds like something from a science fiction plot: So-called threedimensional printers are being used to fashion prosthetic arms and hands, jaw bones, spinal-cord implants - and one day perhaps even living human body parts.

While the parts printed for humans so far have been fashioned from plastic, metal and other inorganic materials, researchers in California and elsewhere also have begun printing living tissue, with the goal of eventually employing these "bioprinters" to create customized kidneys, livers and other organs for people needing transplants. What's particularly attractive about the technology, according to its proponents, is that 3-D printers can produce body parts much quicker and cheaper than other methods.

"You can make things for tens of dollars rather than thousands of dollars," said Stanford University professor Dr. Paul Wang, a cardiovascular and bioengineering expert who is among those studying the printers' potential for prosthetics, replacement bones and other applications. "It's totally opened up what's possible."

Developed in the 1980s by physicist Charles Hull, 3-D printers have been used to make everything from jewelry, toys and guns to smartphone cases, car components and portions of NASA's robotic Mars rover. Last year, a Chinese firm even constructed a five-story apartment building from 3-D-printed walls and other pieces.



Although the process varies, 3-D printing typically involves using an inkjet-like <u>printer</u> that extrudes layer upon layer of substances into shapes digitally fashioned with computer-aided-design software. Applied to medicine in recent years, the technology is producing remarkable results. People missing limbs or suffering other physical problems have been outfitted with printed arms, hands, shoulder joints, heel bones and portions of spines, hips, faces and skulls, among other things.

Bespoke Products of San Francisco 3-D-prints "fairings," which fit around prosthetic legs to make them look more natural. And a researcher for software company Autodesk is helping Ugandan officials learn how to print other prosthetic leg parts for children in that country.

But among the most ambitious dreams for the technology is that it will prove useful for making implantable human tissue, especially organs, which are in short supply, said Carlos Olguin, who is part of an Autodesk research team he describes as "looking at life as a new design frontier." Replacement organs, he said, are a "need that is not being satisfied at all in many cases."

One company working on that problem with Autodesk's help is Organovo of San Diego.

Using a combination of cells in what it terms "bio-ink," Organovo already has 3-D-printed <u>blood vessels</u> as well as liver, lung and breasttumor tissues for laboratory studies of potential treatments for cancer, Parkinson's disease and pulmonary hypertension. Although the company has yet to be profitable since it was incorporated in 2007, it has forged partnerships with several research institutions and drug companies, including giant Hoffman La Roche.

Many experts caution that printing viable <u>replacement organs</u> will prove extremely difficult, especially for such complex organs as the brain. In



addition, it's hard to print the blood-vessel networks needed to replenish organs with oxygen and nutrients. Nonetheless, University of Pennsylvania researchers say they've designed a way to print those networks and a Russian company, 3-D Bioprinting Solutions, has vowed this year to 3-D-print a transplantable thyroid gland, which is laced with blood vessels.

Still other researchers are 3-D-printing insulin-producing pancreatic tissues to help manage diabetes, viruses that can attack cancer cells and organ models that surgeons can practice on or that can be used to help design medical devices.

Stanford's Wang, for example, has made a 3-D-printed model of the heart along with a prototype of a tiny gadget he envisions one day could crawl though real hearts to gather information on the organ's health or kill cells that damage it.

The business-information firm Visiongain has estimated that the 3-Dprinting medical market could generate about \$4 billion in 2018. But Lux Research, which tracks emerging technologies, has a far more conservative forecast. Assessing the current market at \$25 million annually, it projects the business will reach no more than \$638 million by 2025.

One of the biggest challenges for the industry will be convincing the government of the safety and efficacy of implanting bioprinted tissues into people, said Anthony Vicari, a Lux research associate.

"I think it's going to be held back more than some of the advocates expect by the difficulty of getting regulatory approval," he said. "That's likely to slow things down."

Attracting potential investors could be another barrier, said Shaochen



Chen, a University of California, San Diego nanoengineering professor experimenting with 3-D printers to make blood vessels and a liver-like device that can remove blood toxins.

Although he believes the business "will be big," he added, "this is a relatively new field and it takes a while for people to recognize its importance."

Yet despite such challenges, many people are encouraged by the impact 3-D printing already is having on health care.

"It's going to be a long road; there are a lot of hurdles ahead of us," said Michael Renard, Organovo's executive vice president for commercial operations. "But there is a lot that's showing us it's worth continuing to move forward."

©2015 San Jose Mercury News (San Jose, Calif.) Distributed by Tribune Content Agency, LLC

Citation: 3-D printers to make human body parts? It's happening (2015, February 4) retrieved 4 June 2024 from <u>https://phys.org/news/2015-02-d-printers-human-body.html</u>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.