NEWSLETTER

ITECH COMMITTEE

Electronic Inks Make 3-D printing More Promising

A startup called Voxel8 is using materials expertise to extend the capabilities of 3-D printing.

Three cofounders of Voxel8, a Harvard spinoff, are showing me a toy they've made. At the company's lab space—a couple of cluttered work benches in a big warehouse it shares with other startups—a bright-orange quadcopter takes flight and hovers above tangles of wires, computer equipment, coffee mugs, and spare Parts. Voxel8 isn't trying to get into the toy business. The hand-sized drone serves to show off the capabilities of the company's new 3-D printing technology. Voxel8 has developed a machine that can print both highly conductive inks for circuits along with plastic. This makes it possible to do away with conventional circuit boards, the size and shape of which constrain designs and add extra bulk to devices.

Conductive ink is just one of many new materials Voxel8 is planning to use to transform 3-D printing. The new ink is not only highly conductive and printable at room temperature; it also stays where it's put. Voxel8 uses the ink to connect conventional components—like computer chips and motors—and to fabricate some electronic components, such as antennas.

The company made the quadcopter by printing its plastic body layer by layer, periodically switching to printing conductive lines that became embedded by successive layers of plastic. At the appropriate points in the process, the Voxel8 team would stop, manually add a component, such as an LED, and then start the printer again. The real goal is to work with customers to discover new applications that can only be produced via 3-D printing.

Voxel8's business plan is to start by selling the conductive ink and a desktop 3-D printer. The machine is designed primarily to produce prototypes, not to manufacture large quantities of finished product. The company's long-term goal ,however, is to create industrial manufacturing equipment that can print large numbers of specialized materials simultaneously, which will enable new kinds of devices.

The founders will draw on a large collection of novel materials—and strategies for designing new ones—developed over the last decade by cofounder Jennifer Lewis, a professor of biologically inspired engineering at Harvard (see "Microscale 3-D printing).

One of Lewis's key insights has been how to design materials that flow under pressure—such as in a printer-head nozzle—but immediately solidify when the pressure is removed. This is done by engineering microscopic particles to spontaneously form networks that hold the material in place. Those particles can be made of various materials: strong structural ones that can survive high temperatures, as well as epoxies, ceramics, and materials for resistors, capacitors, batteries, motors, and electromagnets, among many other things (see"printing Batteries").

An increasing number of states, including Rajasthan, Gujarat, and Andhra Pradesh, are leasing public lands for solar parks. This eliminates the need for solar developers to work through India's complex land registries to support their own solar farm."The long-term possibility is almost endless numbers of materials being coprinted together with superfine resolution," says cofounder and hardware lead Michael Bell. "That's far more interesting than printing a single material."

Smart Watches Show More Style and Substance

New and improved smart watches were unveiled at Mobile World Congress—but consumers remain unconvinced. Gadget makers are struggling to attract consumers to smart watches, which havesold in modest quantities compared to smartphones and tablets.

The Apple Watch, which goes on sale next month, will either give the emerging category a major boost or confirm that wrist-worn computers are a niche interest. Unlike the first round of smart watches, the LG Urbane or the Huawei Watch, both announced at MWC this week, might pass for conventional luxury timepieces when their round screens are in watch mode. Both are handsomely designed and come in multiple colors with metal and leather straps. Unlike most smart watches, which have toughened glass, the Huawei model, which goes on sale this summer, features a sapphire crystal face. It was also clear on the Mobile World Congress exhibition floor today that watchmakers, fitness companies, and smartphone-makers are all exploring what they have to offer each other. The Huawei Watch was on display alongside the Talkband, a wristband with a removable hands-free Bluetooth earpiece. At a nearby stand, a wall of fitness bands revealed more colors than the rainbow.Something will need to change for smart watches to outsell the fitness bands that currently dominate wearable sales. A Price

surveyed last year were interested in fitness bands but only 35 percent said they wanted smart watches. The sales data show an even more lopsided preference for brawn over brains: Consumers purchased 13.5 million health and fitness trackers last year, according to market research firm GFK, compared with four million smart watches Future watches may also need to compete on user interaction and design as much as on raw features. That seems to be the lesson from early entrant Pebble, which recently announced a new design and interface for its watches (see "A Smart-Watch Pioneer Has an Answer for Apple"). Late last month Pebble launched yet another crowdfunding and presale campaign, and has already raised almost 28 times its original goal.

Apple's Real Car Play

The world's most valuable company doesn't need to build a car in order to reinvent driving. It's been fascinating to read all the recent discussion and speculation over Apple's supposed car project—and to wonder if a company that already dominates several huge product categories thanks to innovative design and engineering might pull off the same trick with the automobile. I think most of the talk misses an important point, though. Apple may well intend to reinvent driving, but it hardly needs to build its own car to do that. Its ambitions are, I think, more likely focused on the software and interfaces found in vehicles—the code that shapes the driving experience, and increasingly makes vehicles actually run—than on developing the expertise needed to manufacture hardware such as chassis and brake lights. To some degree, Apple has already begun this journey with Car Play, software preinstalled in some new cars that transfers functionality from an iPhone to the vehicle's interior (see above). A smarter strategy, surely, would be to invest in developing new software, and maybe some new hardware, that transforms the driving experience, and then sell that technology to as many car manufacturers as possible.

This is one area of the auto industry that does seem ripe for the Apple touch. The interfaces in cars are inconsistent at best, and often downright infuriating. The road that began with Car Play could gradually lead Apple to control more and more of the information, entertainment, and services found in cars. This would play to its considerable strengths in design, UX, and software/hardware integration while also helping lock people into its ecosystem—something that serves its existing hardware and software products nicely. The vehicle interface might seem like a small part of the auto picture, but appearances can be deceptive. As cars become more automated, the interface will play an important role, helping drivers manage automation and helping cars manage their drivers' attention (see "Proceed with Caution Toward the Self- Driving Car"). Apple might eventually reach further into the vehicle, offering software that monitors engine performance, power systems, sensors, and so forth. The company's rumored research on vehicle sensors and batteries would fit with such a plan.All this might seem like a distinctly Microsoft approach. But then, perhaps Apple envisions a future in which information, services, and entertainment are not served from any one product or device—but from a whole host of intelligent gadgets and appliances. In such a world, rewriting the code that runs inside cars would be more transformative than building one from scratch.

Virtual Creatures in a Box, Controlled by You

A startup uses an old parlor trick and smartphone sensing to let you control virtual objects in a see-through box.A Canadian startup is working to make monsters, fish, and other creatures seem to come alive inside a tabletop box. The company, H+, hopes you'll use the device to play games and do other activities with friends. The startup is still in the prototype stage with Holus—a see-through box roughly the size of a microwave. Inside is a coated plexiglass prism within which projected images appear, allowing you to see virtual characters and content from different viewpoints. The company has built five Holus units so far, and hopes to start shipping them next year.H+'s chief technology officer, Dhruv Adhia, says Holus combines elements of 3-D projection with an old optical trick called "Pepper's Ghost," wherein a hidden object is reflected on a glass panel to make it appear to be in the room with you.

A projector inside the lid of Holus beams four images of the same object onto the walls of the prism, and to the user they appear to form a single image. Users can control the images with a smartphone connected via Bluetooth or Wi-Fi. A tablet computer or laptop attached to the box runs an app that feeds images to the projector, and adjusts what you see based on input from the controller. Images appeared to be visible from multiple angles, and were responsive to swipes and movements he made with the iPod. But it looked far more primitive than some other 3-D augmented-reality efforts. Another company, called Leia, is developing a new optical technique that brings glasses- free holographic images to mobile gadgets. Michael Bove, the leader of the object-based media group at the MIT Media Lab, also noted that the H+ technology appears to be neither holographic nor actually 3-D, meaning you couldn't walk around it and see a smooth 360-degree view of the image being projected. Previous efforts have suffered from poor latency—the time between a player making an input on the controller and seeing the result on the screen. Players often grow frustrated when a game takes a fraction of a second too long to register their input. Techniques used to reduce latency for games could also improve other online services, such as videoconferencing and high-resolution movie streaming. H+ hopes to drum up interest by selling its device through Kickstarter this spring. It wants to convince people to shell out about $850 or $950 for their own Holus, depending on whether buyers want a "home" version or a larger one geared toward developers.