



## PLAN | SMART IDEAS



“Bio-plastic firms are growing—and, in one case, mushrooming.”

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**I**N THE 1967 movie *The Graduate*, Dustin Hoffman receives one-word career advice that conjures a bright future: “plastics.” In today’s remake, the word might be “mushrooms.”

At least that’s the remake envisioned by Green Island, N.Y., outfit Ecovative. The founders, Eben Bayer and Gavin McIntyre, are convinced that they’ll be able to create mushroom-based products to take the place of most plastics, and they’ve already put some on the market. They join a legion of entrepreneurs committed to making the planet a greener, less toxic place. “Our goal is to eliminate as many plastics as possible,” says Bayer, the chief executive officer.

Plastics are environmental migraines for a host of reasons: Oil is one of their main building blocks, many are made from known carcinogens, and most don’t break down in landfills. Five years ago, Bayer and McIntyre discovered that a mushroom’s mycelium, white threadlike offshoots that function like roots, could bind particles like glue and be used for insulation. In figuring out how to harness their fungus, they’ve seen plenty of trial and error. But Bayer sees a bright future. “We’re where plastics were 50 years ago.”

Ecovative is getting a foothold among companies searching for earth-

friendly plastic alternatives. It has sold its spongy, beige packing materials to companies including furniture firm Steelcase, Dell and Crate & Barrel, and Bayer says this year’s revenue should top \$3 million. Sealed Air, maker of Bubble Wrap, has become a partner. 3M is an investor. Puma is working with them to make mushroomy flip-flops.



Ecovative isn’t alone in its field. So-called bio-plastic companies, using organic ingredients like chicken feathers, algae and soy, compose less than 1 percent of the \$560 billion industry, but they’re growing at 20 percent a year, according to SPI, the plastics industry trade association. The group says it supports the movement: “You see a lot of creativity,” says Melissa Hockstad, its vice president of science, technology and regulatory affairs.

Ecovative’s founders are mechanical engineers trained at

Rensselaer Polytechnic Institute. With replacing plastics as their goal, they grew mycelium under their beds for an “inventor’s studio” class that required them to develop a patentable idea. After graduation, their professor, Burt Swersey, persuaded them to quit their jobs and even became their first investor, borrowing from his retirement account.

At first, the inventors tried to license their technology to the construction industry as insulation. No go. Next, they pitched it as packing material, to displace Styrofoam, a product so ecologically damning it’s fun to hate. Their big break came when they won a foundation grant that allowed them to start manufacturing on their own.

Customers came. One was Dell, which is using an Ecovative product in a pilot program for shipping one of its servers. The mushroom packaging offers more cushioning than polyethylene but did require some reengineering, says Oliver Campbell, Dell’s procurement director. Ecovative’s products often cost 10 percent more than their nonorganic rivals. That may change if the company gets a large-scale factory of its own, but for now, Bayer acknowledges, it’s a marketing obstacle: “We know it’s not enough to be green.”

The company’s factory in upstate New York smells a little like a barn. On the floor is a bale of cotton hulls, agricultural waste that will become the

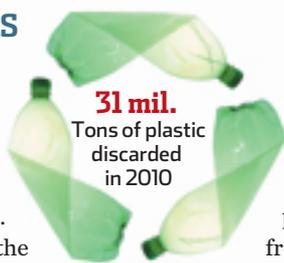
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fungi's next meal. Finding the right mushroom food has been a long-term hassle. The founders tried feeding the fungi lobster shells, dryer fuzz and cat hair, Bayer says, but all were spiked "due to grossness." The hulls get cleaned in a contraption the two engineers rigged from an old asparagus blancher and are then inoculated with mycelia. Ecovative brews the mycelium liquid in a "clean room," where petri dishes of cloned fungi are stored like pastries on baker's shelves.

But these fungi never get to "fruit," or pop a mushroom. The mycelia are escorted to a shaping mold via a chocolate-chip-cookie machine the engineers adapted, and there they do their thing. The mycelium forms a type of glue, and the packing material forms itself five days later. (It comes out a mushroomy color—a potential turn-off to clients who want their packing stuff bright white.) Then the



**31 mil.**

Tons of plastic discarded in 2010

mycelium is killed with a blast of heat—to prevent a mushroom from accidentally sprouting from the finished product.

Switching from *The Graduate* to *Alien* or *The Thing*, the founders envision products that would behave like living creatures—including self-repairing bicycle helmets, auto bumpers and roofs. The organisms would live in suspended animation, and react when stressed. A shoe, for instance, could be dampened and put into a plastic bag, setting off a reaction in which it would fix itself.

All these products are still drawing-board dreams, of course. But whichever ones come to fruition, Bayer says, they'll have one key edge. Making bio-plastics from bacteria or crops creates some kind of waste, but mycelium becomes the "plastic" and leaves no waste. "His entire body is plastic," enthuses Bayer. ☺

## NEW AGE MATERIALS

Ecovative uses agricultural waste to make its earth-friendly plastic, but other companies are using food crops and even sludge.

► **Eastern BioPlastics**, based in Harrisonburg, Va., blends chicken feathers with polymers to make resin. It's being used in horticulture pots, and the company is working with manufacturers to test resin for automotive parts and office furniture.

► **Micromidas**, a Sacramento start-up, is working on making plastic out of sewage. Founder John Bissell has venture funding to explore using microbes to turn sludge into biodegradable plastic.

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