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INVENTIONS: AT RENSSELAER POLYTECHNIC INSTITUTE
Using Mushrooms to Grow Environmentally Friendly (but Inedible) Insulation

By GOLDIE BLUMENSTYK

What it is: A method for bonding insulating material using the mycelia, or roots, of mushrooms. The technique results in a product that is biodegradable and can be produced using less energy than needed for other types of insulation, and without petroleum or chlorofluorocarbons.

The market: Industry experts say annual insulation sales in the United States could reach $10-billion by 2010. "Green" products account for about 2 percent of the construction-materials market, a proportion that is predicted to rise to as high as 10 percent by 2010.

The spark: Raised on a farm in Vermont that produces maple syrup, Eben Bayer is acutely aware of climate issues. As an undergraduate in mechanical engineering at Rensselaer Polytechnic Institute, he took a yearlong course called "Inventor's Studio" in which his project was to help find a new kind of home insulation. "I've always really been interested in heating and cooling," he says.

He found that insulation techniques over the past century have included things like fiberglass, foam, cellulose, and loose perlite, a mineral that is familiar to backyard gardeners as the Styrofoam-like particles in potting soil.

He found the first three problematic: fiberglass can be carcinogenic, foam is made with petroleum, and cellulose is flammable unless treated with chemicals. But the perlite intrigued him. He knew that commercial mushroom growers use perlite to help grow their crops, and that got him thinking about how mushrooms grow in the first place. He began to wonder if the mycelium — the web of hairlike material that provides the basis for a mushroom's growth — would work as a bonding agent with perlite. Those hairs "grow through anything," he says.

Mr. Bayer experimented with a mixture of mushroom cells, water, perlite, and starch. He began by pouring the mixture into a clear container about an inch high and 2.5 inches in diameter, and watched in delight over the next month as the tendrils fed on the starch and began to grow and envelop the perlite, eventually forming a solid material that was 25-percent mycelium.

"This is a new method for bonding particles together," he says. "Nature's doing the work for you."

Developing the invention: Mr. Bayer found the material to be both stronger and lighter than he had expected. He and a classmate, Gavin McIntryre, spent the past semester evaluating

alternatives to perlite, like sawdust and recycled Styrofoam, and growing the material in larger and larger panels.

With funds provided by the National Collegiate Inventors & Innovators Alliance, a nonprofit group, the two traveled to the National Institute of Standards and Technology, a federal agency near Washington, to test the material's resistance to fire and its insulating qualities.

Commercial status: Having graduated in May, Mr. Bayer and Mr. McIntrye have begun the process of seeking patents on their technique and have formed a company, Ecovative Design LLC, to manufacture and sell their product, which they call Greensulate. RPI would own any patents, but 75 percent of the profits from any commercialization would go to the two recent graduates — more than what a faculty inventor would get — because the work was done in the "Inventors' Studio" course. The remaining 25 percent would go back to support the course. Mr. Bayer says he and Mr. McIntyre are trying to decide which material to use as a food source for the mycelia in their first product. "We'd like to be greener, cheaper, and better than the competition," he says.

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