Argonne NATIONAL LABORATORY

Educational and Community Outreach

Fab Labs make manufacturing personal

To build a treehouse, you'll need a hammer, some nails, and a tolerance for splinters. To *print* treehouses, however, you'll probably need a Fab Lab.

Argonne National Laboratory, in conjunction with the University of Chicago, recently helped to launch a Fab Lab at Chicago's Museum of Science and Industry, and others may soon arrive both on site and at several locations in greater Chicagoland.

Conceived by Professor Neil Gershenfeld, director of MIT's Center for Bits and Atoms (CBA) in 2002, Fab Labs – short for fabrication laboratories – support the burgeoning field of "personal manufacturing" by providing non-technical laity as well as engineers with access to the tools and knowledge necessary to create products that satisfy their individual needs.

Each Fab Lab uses open-source software programs developed at and provided by the CBA to run a group of off-the-shelf, though sophisticated and expensive, tools: laser cutters, miniature milling machines that print circuit boards, jigsaws with a precision of a millionth of a meter and a few others. Instead of cranking an Allen wrench or turning a screwdriver, newly minted inventors need only write a bit of computer code and press a couple of buttons to create their devices. Other users can then take the code used to create these products to make perfect replicas, or they can tweak the instructions and create an original design.

This ladybug sculpture was created by a student at the Boston Fab Lab from a single 4-by-8 sheet of plywood.

Although the Fab Labs currently in operation use common tools and software, the devices that they have produced vary widely from lab to lab. In rural northern Norway, a shepherd started a Fab Lab in order to build wireless tags for his sheep so he could keep track of them as they grazed, and eventually converted his lab into supplying wireless technology for his town. Likewise, at an old Hindu hermitage outside of Pune, India, students have built everything from temporary bamboo shelters to gears for photocopiers using Fab Lab technology.

"If you look at Fab Labs around the world, the products that they have

These etchings come from the Fab Lab in Tromso, Norway, located above the Arctic Circle. The designs are designed on a computer and then "printed" onto the wood by extremely precise saws and cutters. One program can produce an unlimited number of replicas.

made represent individual or community needs and not the needs of the originators of the Fab Labs," said Harold Myron, director of Argonne's Division of Educational Programs.

Although no definite arrangements have been made, Myron hopes to bring a Fab Lab to the Argonne Information Center within the next several months, which will then be accessible primarily to touring school groups. Ideally, he said, Argonne, the University of Chicago and the Museum of Science and Industry would then jointly promote the creation of roughly five to 10 "storefront" Fab Labs throughout the Chicago metropolitan area.

"I don't think we're going to have one on the Magnificent Mile, but we can have them in schools, in disadvantaged communities, in the suburbs, in rural areas and at museums," he said. The projects at these Fab Labs could satisfy artistic, technical, commercial or educational needs.

"Here's a chance to recover the spirit of 'if you can think of it, you should also be able to make it,'" said Argonne director Bob Rosner. "This is a lesson located at the very heart of thinking about where our country will be – not just in the 21st century, but even further in the future as well."

Since users at the roughly one dozen Fab Labs – located from Boston to South Africa and Costa Rica to Japan – share so much of their hard- and software, the potential exists for expanded collaboration between inventors, said Argonne computer scientist Ian Foster. "Fab Lab is a dynamic network of grass-roots efforts of people learning by doing, so there's potential for cross-fertilization of ideas about approaches, designs and techniques."

As head of the joint Argonne-University of Chicago Computational Institute, Foster hopes to link the isolated Fab Labs into a united virtual community. The key to doing so, he said, lies in the grid computing technology that he and his colleagues developed at Argonne. Grid computing has already been adopted by a number of companies and organizations that rely on collaborative problem solving – for example, some hospitals have used grid computing so that specialists can examine, diagnose and even treat patients at other hospitals in real time.

Fab Labbers can use grid computing technology to explore the synergies between their different projects in much the same way, according to Foster. "We want to reduce the barriers to collaborative innovation, and that means allowing people to share information, talk to each other or access design tools without regard to distance."

Myron shared Foster's excitement at Fab Lab's potential to create a global learning and creative community. "By using grid computing, we can all access an international cross-current of ideas," he said. "The true beauty of it all is that the Fab Labs in places like The Netherlands and in South Africa are brought here, while at the same time we're brought there."

This matchbox flashlight was built at a Fab Lab in India. The LED-based device is powered by a single AA battery.

Although Argonne will have a large stake in promoting the spread of personal manufacturing," Foster said, "end users will feel most directly the benefits from the expansion of Fab Lab technology. There are many interesting and, in some cases, tricky differences between different Fab Labs. But in every case we're empowering people by giving them the ability to create truly impressive things." — *Jared Sagoff*

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