...legal digital dow...
...few years ago.

"Our goal is to seek out as many [viable] retail ...ts as we can, and put as many titles as we can on ...e sites," says Peter Levinsohn, president of News Corp.'s Fox Digital Media, which has signed deals with many of the emerging online outlets. "Ultimately, we let consu...

The footdragging ... movies has turned to a sprint this year for several reasons. The studios have become more comfortable with online safeguards against piracy. DVD sales growth has been slowing, underscoring the need to foster new sales channels. And electronic distribu-

...doesn't require ... ping, has the potential to create ...

For the most part, studio agre... line distributors allow consumers ... movies, but not to burn them on ... DVD players. That's one reason ...

Please Turn to Page B2, C...

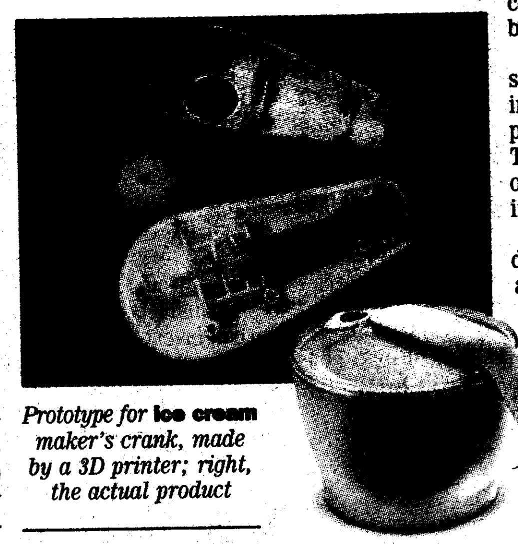
3D Printers Reshape World of Copying

By William M. Bulkeley

TOBY RINGDAHL, a computer-aided-design specialist at shoemaker Timberland Co., recently bought a color 3D printer from Z Corp. that allows footwear designers to see their constructions overnight rather than waiting a week for model-makers to carve them. The printer cost $50,000, but he says it was worth it. "People get pretty amazed when they see a full-color, prototype shoe on the table," Mr. Ringdahl says.

Computer printing is going three-dimensional. In the past four years, designers of a variety of products, including shoes and cellphones, have been buying specialized office printers costing $20,000 to $50,000 that can quickly produce a plastic model using computer-aided-design, or CAD, software.

Though they resemble typical office copiers on the outside, these are not ink-on-paper printers. Rapid prototyping machines were pioneered by 3D Systems Corp., of Valencia, Calif., nearly 20 years ago. They work by taking computer-aided-design data and using it to build a device layer by layer. Inside a 3D printer, either a print head shoots out plastic particles and glue, or an ultraviolet or laser beam passes over a liquid resin bath, hardening a layer of plastic, 3/100ths of an inch thick, in a computer-generated shape. Then the machine builds layer upon layer until the full model is completed, one to four hours later.



Prototype for ice cream maker's crank, made by a 3D printer; right, the actual product

Now the technology is reaching ordinary consumers—even young ones. Later this summer, SolidWorks, a U.S. unit of Dassault Systemes SA, a French maker of design software, plans to start up a new business called Cosmic Modelz that will allow kids to use the technology to create their own customized action-figures.

Children can design a figure using SolidWorks' Cosmic Blob software on their home PCs, then go to a Web site run by 3D printer-maker Z Corp. and order their figures to be "printed" for $25 to $50. It will be kind of an electronic version of the Build-a-Bear Workshop concept where children create customized teddy-bears.

Making consumer toys is just the latest expansion of the rapidly growing 3D printing business. Rapid-prototyping machines used to cost well over $100,000, but some models are now under $20,000, prompting small businesses and high-school and college shop classes to buy them.

"Our technology mission is to make 3D printing as fast and easy as printing on paper," says Tom Clay, chief executive of Z Corp., based in Burlington, Mass.

Terry Wohlers, president of Wohlers Associates, a Fort Collins, Colo., market research firm, says 3D printing is the fastest growing part of the rapid-prototyping industry, which had revenue of $809 million in 2005, up from an estimated $705 million in 2004. Revenues come from services, materials and the machines themselves, which make models and specialized parts.

Some experts say within a few years hobbyists will have their own low-cost machines, many created by other 3D printers. Adrian Bowyer, a mechanical engineering lecturer at the University of Bath in England, says he is developing a 3D printer that, when connected to a PC, will be capable of recreating most of its own parts—allowing individuals to build new 3D printers for little more than the cost of the plastic resin.

3D printers can't replicate semiconductors

Please Turn to Page B4, Column 3