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## 3-D Printing, Copyright, and Fair Use: What Should We Know?

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Over the past few years, 3-D printing has rapidly become more affordable and accessible. Specialized printers, along with software for creating files used to print 3-D objects, are now readily available to consumers. While 3-D printing introduces exciting, lucrative new ways to create physical objects for large-scale manufacturing, the consumer market, teaching and learning, and much more, copyright and patent law also pose potential limitations on many 3-D-printed items that are considered derivative works. As advocates for teaching and learning and as clearinghouses for copyright guidelines, what role might libraries have in providing access to 3-D printing “makerspaces” in higher education? As these new capacities develop, what special considerations should be made to ensure reasonable accommodations for visually impaired learners?

### Status of the Current 3-D Printing Landscape

The wide-ranging list of items created so far using 3-D printers almost reads like a page out of a sci-fi novel. Fully functioning plastic and metal guns, cars, figurines, jewelry, models/prototypes, and custom prosthetics are only a few examples. Beyond items printed in basic plastic materials, the industry is eyeing new possibilities, including the ability to 3-D print biomaterials and even mixed material objects. How long will it be before we begin referring to 3-D printers as “replicators”? The PBS video *Will 3D Printing Change the World?* (<http://youtu.be/X5AZzOw7FwA>) showcases some recent examples.

The benefits of crowdsourcing and social networking dovetailed nicely to support an instant “maker” community of individuals who create and post files that are ready-made to print 3-D objects. Sites like Thingiverse ([www.thingiverse.com](http://www.thingiverse.com)) and Shapeways ([www.shapeways.com](http://www.shapeways.com)) offer repositories of 3-D

ready files and easy ways to order printed objects for those who want the convenience of an on-demand service. Many of the available 3-D-printed objects from repositories like these are priced comparably to their traditionally created counterparts. One advantage 3-D-printed objects offer over traditionally manufactured objects is that they can often be affordably customized in ways and on scales that would never be affordable for mass object creation. Files can be altered to make customizations, and the customized objects can be printed on demand.

### Intellectual Property Concerns

But with the ease and affordability of copying physical objects come concerns about ownership of materials. While copyright law does not protect ideas, it does protect the materials created to express ideas. Under U.S. copyright law, the right to create derivative works is explicitly reserved for the author. Unless the author grants rights otherwise, no one else is authorized to make adaptations of those same copyrighted materials.

As a major source of information vital for research and learning at universities, academic libraries are familiar with copyright law restrictions. Rather than the role of copyright enforcer, academic libraries often embrace the role of copyright educator and facilitator. Libraries have historically provided for long-term preservation of information. During the digital revolution, the library’s role has expanded to include support and infrastructure for the creation of knowledge.

As 3-D printing becomes more deeply ingrained into the fabric of society—both in manufacturing channels and in the consumer market—libraries, as advocates of intellectual innovation, are being expected to stay informed about 3-D printing developments and even lead implementation efforts. The wealth of knowledge in libraries begs the question: Do 3-D printers belong in academic libraries? If so, libraries have a responsibility to

educate their patrons about fair use and guidelines for intellectual property related to copyrighted content and 3-D-printed objects created from that content.

Both public libraries and academic libraries have begun offering 3-D printer “makerspaces,” along with introductory classes to orient patrons to the concepts and the technology. Adding a 3-D printer to the suite of services libraries offer goes beyond merely fulfilling a university’s emerging technology needs. It places the ability to create new things directly in the hands of a library’s patrons.

### **No U.S. Lawsuits Yet, but Takedown Demands Growing**

Anytime a revolutionary new capability is introduced into society, some individuals will intentionally or unwittingly push the boundaries of the law. In the 1984 Supreme Court case of *Universal v. Sony*, the plaintiff argued that the technology offered by Sony (VHS recorders) infringed its copyrights. But the highest court ruled that the technology itself is not responsible for infringement. When technologies enable easy reproduction and dissemination of copyrighted content, companies have fought hard to maintain control over their copyrighted content and protect their potential profits.

3-D file repositories allow community members to post files without mediation, but well-run sites are responsive to takedown requests and promptly address intellectual property infringement claims. After fans began posting files based on well-known characters, some companies have begun proactively creating their own files and streaming directly to affiliated commercial 3-D printers in an attempt to preempt homegrown efforts and to capture any new potential streams of revenue.

Rights for 3-D-printed objects are also complicated because they involve more than just copyright. Copyright protects the expression of ideas in published works, while patent law protects objects that have unique purpose. As the cost of 3-D scanners continues to decrease and their capabilities continue to increase, consumers will be able to easily replicate more objects, likely

prompting further claims of infringement. Another valid concern is that items regulated by government agencies will not have any review to ensure safety or other compliances.

### **Easy Ways to Create .STL Files**

In the past, stereolithographic files (.STL) required calculations made by expensive, complicated, computer-aided design software, such as AutoCAD. New apps like PhotoMesh can render 2-D files as 3-D files fairly easily. 3-D scanner software, such as 123Catch, also provides an alternative method for creating files ready to be used to create 3-D-printed objects. In addition, new tools can be used to directly create free-form 3-D-printed objects, such as the 3Doodler pen ([www.the3doodler.com](http://www.the3doodler.com)). Some file manipulation may be required for optimal object creation.

### **Tactile Learning Objects for the Visually Impaired**

Dr. Michael Kolitsky has been teaching online courses in the biological sciences since 2001 and has been experimenting with 3-D printing for several years. His course materials are heavily image based. As Dr. Kolitsky pondered his students’ different learning styles and understood that visually impaired students would not be able to experience and understand image-based learning objects in the same way as his sighted students, a spark of an idea occurred to him. He realized that he could quickly and easily convert 2-D files of microscope and telescope images into 3-D tactile learning objects for visually impaired students.

Rather than mere static solid objects, Dr. Kolitsky takes the idea a step further by incorporating “smart” elements to create tactile learning objects. For example, he uses 2-D electron microscope images of a dividing cell to print 3-D objects that represent various cell phases. He 3-D prints Braille objects with the names of each cell phase and prints 3-D line graphic prints that represent the basic structural elements of each cell phase. Then, he uses a smart pen to encode a tiny dot of information about each object. The result is a learning object that can be experienced through touch and sound.

The June 2013 World Intellectual Property Organization (WIPO) ([www.wipo.int/pressroom/en/articles/2013/article\\_0017.html](http://www.wipo.int/pressroom/en/articles/2013/article_0017.html)) established unprecedented international support for the visually impaired by adopting a treaty that stipulates exceptions to copyright law to make published works available in accessible formats. Recent court cases involving fair use have yielded

decisions that uphold transformative uses as legal, such as recreating even copyright-protected materials in new formats for access by the visually impaired. Given the legal directive for universities to provide reasonable accommodations to visually impaired students, it would seem that 3-D-printed tactile learning objects could be one way to fulfill this.

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